The Practical Teacher

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Edited by JOSEPH HUGHES.

'*Knowledge is proud that he has learned so much,*
Wisdom is humble that he knows no more.'—COWPER.

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WELL-KNOWN TEACHERS AT WORK.

XVI.—MR. RICHARD WADDINGTON.

St. James' N. School, Bolton.

IT is a land afflicted with a plague of Stone! Great slabs crust the pathways, solid slices clothe the roofs, where cosy thatch should be; shambling ranks of shale do service for green hedges; ugly-looking chunks—their upper surfaces worn smooth by many cart-wheels—lie welded together on the roadways. Stone frowns at you out of a cold December sky; stone scowls down from the blackened visages of Old Bailey-like mills; and, withal, stone smiles in clean white patches around the windows and thresholds of the cottages which dance by as the Midland express roars ahead.

It is worse! It is a land accursed with a plague of Smoke! Tall chimneys fume in thick black sighs, smaller ones are bursting with an envy that ravishes the pure air of heaven. Smoke lies as a funeral pall upon all things quick and inanimate. They wear it for Nature's sake. It is she whom they have slain. Mighty moles have burrowed into the country-side here and there and everywhere, casting up of their refuse as though they would blotch the fair face of earth with hideous excrescence. Over all a monstrous volcano has belched, obliterating Nature's features under the smouldering crust of molten scoria and ash.

In other words, dear reader, I have been a-musing on my way from Manchester to Bolton, and now I am there, and must sink the philosopher in the mere perambulating note of Interrogation. For, so it please you, I am, at your service, 'The Interviewer,' and my quarry, the Champion of England's Juvenile Operative!

Obligingly he meets me at the Midland Station. That is exactly what you would expect Richard Waddington to do. In no man living breathes there a kindlier or a more good-natured spirit. As we clatter along the rough-shod streets, I quiz him, of course. He is tall, hard-knit, and as lithe as a lancewood sapling. He looks hard-wrought—as, indeed, he may well do. He talks pointedly, flings his arms about, is generally unconventional, and tells off his arguments, *seriatim*, on the points of his fingers. His voice betrays the ravages of hard wear, but his verve and activity are as unquenchable as quicksilver.

'Half-time' is the theme he treats you to for a start, punctuating his remarks by rapid dashes, which are designed to call your somewhat bewildered faculties to 'tallest chimney in England,' 'town-hall, see?' 'market!' and so on.

'Half-time' is the main staple of the self-acting loom which rolls off leagues of interesting and often pathetic facts relative to child-labour in Lancashire. 'Half-time' is the word with which he bids you adieu at the finish. Oh, he is, in good sooth, a very full Half-timer!

'This is Dobson's.' The clocks are on the stroke of half-past one as we pass. Hundreds of the 'hands' stand aimlessly about, awaiting the opening of the big gates. Hard-wrought, too, *they* look. 'See! There's a Half-timer!' and Mr. Waddington clutched my arm as though we had been angling for the best part of the day and had just got a nibble. Aye, there he was, poor little chap—clogs, unkempt hair, pinched face and all—with the cotton fluff of the week before last speckling his scanty garments. We had some difficulty in picking our way through the crowd, and I had some fear for my friend's safety, for under certain circumstances these operatives, I had no doubt, could look ugly. 'Aren't you a bit afraid of the clogs,' I said, 'seeing that your agitation appears to militate against the immediate pecuniary welfare of the operatives?'

'Not a bit!' replied he. 'The great bulk of the operatives are as right as a trivet on the question. They know very well that the abolition of half-time means their ultimate advantage—to put it on no higher ground.' And I observed that everybody recognised my guide, many of them tipping him a friendly glance of recognition, and every one of them feeling that there was indeed a man in their midst—a man whose name will rank with the Mundellas, the Buxtons, and the Mannings, when the story of the emancipation of the little factory slave comes to be written.

And so we passed through Dobson's 'hands' and

BRITISH MUSEUM

came, as Pepys would say, to St. James' School by way of Bridge Street.

I found myself within sight of a large square building designed very much on the Bolton Mill style of architecture. Crowds of operatives, men and women, with here and there a sprinkling of youngsters, jostled by as we passed along. Let me note the surroundings of the school. The parish is evidently peopled by typical Lancashire artisans, who, judged by their homes, are fairly well-to-do. Hard by the school stands a well-built church, whose blackened walls pay silent tribute to King Cotton's smoky influence.

Hurrying up a spacious flight of stairs—'We are a few minutes behind time, and they are all in,' says my companion—we enter the large schoolroom. The interior is in striking contrast to the smoke-begrimed exterior.

The individuality, industry, and ingenuity of the master are strikingly exhibited by the well-covered walls, and even by the floor, whereon is marked a square pole, a chain, etc.

Amid neatly-framed pictures, which almost cover the four walls, are numberless curios and specimens illustrating the various industries. On yonder wall are geometrical figures cut out in cardboard, the clearly-printed names plainly indicating the difference between a triangle and a square. Here is a home-made ruler showing a 'metre'; and there in the place of honour over the rostrum hangs a framed list of children 'never absent, never late' since 1887.

Around, the boys and girls—for it is a mixed school—are steadily at work. They are too busy to note the presence of a stranger, and the master leaves me for a moment at his desk, whilst he sees that in every department of the work everything is as it should be.

Presently he returns.

'You see they are all busy; I am sorry I have to leave you, but I am relieving a pupil teacher for study this afternoon, so, really, I have Standard V. on my hands.'

To Standard V. we go.

'Here they are, fifty of them! Forty-two of them half-timers. Look fagged? No wonder. Most of them have done six hours in a factory this morning. Nearly all of them were up at 4.30 or five this morning, and tramped through the rain to the mill. That boy yonder walked a couple of miles to the mill, and worked in an atmosphere seldom below 90°, often over 100°. He's a "little piecer." This little girl turned out at 5.30 this morning; she's a "knotter." Last week she earned tenpence, for thirty hours' work. Oh, yes! The "piecers" earn four shillings and four shillings and threepence. That poor careworn, overworked lad is a "piecer." He was a bright enough boy before he went half-time. Yes. He wants more sleep and less work. His father earns over two pounds a week—it's the old story.'

I silently wondered at the shameful and heartless ignorance of Mr. Home Secretary Matthews, when he tried to hoodwink the House of Commons into believing that the half-timer was brighter and educationally in advance of the whole-day scholar.

'But I understand that the children like to go half-time?' said I.

'Yes; that is unfortunately true at first. You see the parents are inured, and the child is made to feel that he ought to be "bringing something in" at ten, and a weekly allowance of sixpence or ninepence "for himself" is made out of what he brings home. Then the parent, having received the wage, refuses to allow the child to cease work, and says: "Naw! Tha' begun of th' own accord, and tha'll keep on. I towld thee before tha' begun."'

'Do you find these children affect the result of your examination?'

'No, I do not, but I did before the Hart Dyke Code. Liberty of classification has been our salvation. The first year we had "Freedom of Classification" I degraded one-third of my Standard VI., and now I don't allow any half-timer to be promoted until I am certain he can do the work in half the time.'

'Short of total abolition of half-time—for I fear the country is scarcely ready for that—what can be done to ameliorate the conditions of this wretched Child Labour?' I asked.

'In every town the half-timers should be gathered into special schools, as is done in Leicester and partially in Bradford. The legislature should prohibit all child labour before 8 a.m., and these schools should be considered schools of "special difficulty," with a curriculum sufficiently varied to be in some sense recreative. This is required alike in the interest of the half-timers and the whole-day scholars. In towns like Bolton, where two out of every three children over ten years of age are at work half-time, the education of the children whose parents withstand the temptation of the weekly wage is "cribbed, cabined, and confined" because of the presence of the half-timer. As soon as you isolated the worker, the parent would awaken to the fact that he was seriously handicapping the child. But still worse than our factory half-time is much of the "domestic" half-time, with its spasmodic attendance. The fact that in some districts the child makes half-time by attending six months at a stretch and absenting himself another six months, as recently pointed out in the *Schoolmaster*, calls for the immediate attention of the legislature. How the teachers arrange their work to meet such cases passes the wit of man and——'

'Quite true,' I interrupted. 'But now I should like to hear about your plan of campaign for minimising as far as possible the difficulties of the situation; you have a system, of course?'

'Yes. Briefly, our system is to divide the work into eight portions, one of which is allotted to each of the first eight months. Taking out two months for holidays, we have two months left for revision. Each Wednesday morning there is an informal examination in writing and arithmetic, and the papers, after being marked, are sent home to the parents. Every fourth week there is a complete examination in the work set up to date. The papers are marked on a system, so that the parent may understand the value of the assessment. To acquaint the parents with this system, our programme for the Annual Prize Distribution contains a facsimile of the marking. Here is a copy of our last year's programme.' And Mr. Waddington handed me a tastefully got-up programme, a veritable encyclopœdia of the school work, whereon I found the following:—

TO PARENTS.

Every child in Standards III., IV., V., VI., and VII. is examined by the Head Master, and the Paper worked by the child is sent home, so that the parent may see the child's progress. See you get them.

How the papers are marked for Writing.

P^1	P^2	P^1	O^7
Excellent.	Very Good.	Fair.	Bad—7 Mistakes.

How the Papers are marked for Arithmetic.

4	3	2	1	0
4 Sums Correct.	3 Sums Correct.	2 Sums Correct.	1 Sum Correct.	None Correct.

See these papers, and your children will get on.

After congratulating Mr. Waddington on his school reports, I said—

'I see that two of your pupil teachers have won "Thomasson Prizes for Pupil Teachers." What are these?'

'Mr. J. P. Thomasson, late M.P. for the borough, has for many years supported a valuable series of scholarships both for scholars and pupil teachers. There is a separate examination, conducted by H.M.I., extending over two days. There are five scholarships of £5 each for each of the four years. The examination is open to all schools—Board and Voluntary. The scholarship is increased, if left in the hands of the Board, until entry into a Training College. That lad there has won the scholarship in three successive years, and if he succeeds next year will have £30 towards his college expenses.'

'Do the voluntary schools generally succeed in these competitions?'

'No,' replied Mr. Waddington; 'it is the old story. The voluntary pupil teacher is heavily handicapped. My school is sufficiently large to enable me to give time for private study during school hours, or I should be unable to compete successfully. For the last four months before the scholarship I manage to make my pupil teachers pretty nearly half-timers, with the result that each year we obtain one or more. This year we obtained two with three pupil teachers.'

'What success have your pupil teachers had after leaving you'? was my next query.

'One is Head Mistress of a large Board School; another has taken third year's papers and is on the staff at Whitelands; another is now in Battersea; and another has just passed the intermediate B.A. at Victoria University. Not a bad list for seven years' work!' says Mr. Waddington with a smile.

Richard Waddington

'But now, about yourself?' I interject.

'I was born at Salford, and was a scholar and pupil teacher under the late Mr. W. Hindshaw, at Egerton Boys' School. Here I made the acquaintance of the factory half-timer, and as a pupil teacher made up a pile of "time books" every Friday. Once a quarter I had to journey to the neighbouring cotton mill to receive the school fees of these half-timers, and there received an object-lesson that even then stirred me to the quick. The picture of these "mites" in a state of nudity, save for a pair of linen knickers, dodging in and out of the machinery, photographed itself on my retina so strongly that a dozen years have not served to efface it. In 1879 I was appointed assistant at Pike's Lane Board School—a large half-time school—under Mr. George Sharples, to whom I owe whatever powers of organisation I possess. Fortune next took me to Christ Church Upper School, Salford, and for three years I left the land of half-time for the Higher Grade School. Here, under Mr. John Roberts—the best of masters and most sympathetic of friends—I gathered much practical experience in the art of teaching, and many useful "tips" in the matter of school management. In 1883 I migrated to the Spring Grove Board School, Huddersfield, where I met Mr. Macnamara, now the editor of the *Schoolmaster*. From that day to this there has existed between us a close and affectionate friendship, which time has only served to ripen and distance to cement. Ah! I could tell you many a laughable story of the days when he and I were fellow lodgers, and at least one laughable incident of occasions since that time when, for the brief space of Conference Week, we have again been fellow house-mates. Those who were present at the Cardiff Conference, when "T. J." made such an onslaught against raising the subscription for Parliamentary purposes, were somewhat astonished at the way I was able to answer every one of his arguments. The story tells against me, I know; but the fact is we had been discussing them for about a week before, having shared the same bedroom, and I had my revenge for having been kept awake for the previous three or four nights listening to all sorts of ingenious arguments against the "Parliamentary

Shilling"! And no one looked more amused as I proceeded to "give him away" than "T. J." himself, laughed Mr. Waddington. 'Looking back to my two years' life in Huddersfield,' continued he, 'I feel that I owe much of the enthusiasm I possess to the infectious and restless zeal of this sturdy champion of Unionism. I took charge of my present school in 1885, when the inefficiency of the school was really almost a by-word in the town. We are now in a much better position, and the result is that during the last seven years we have nearly doubled our numbers. This, I sincerely assure you, is largely due to the enthusiastic way all my efforts have been seconded by my fellow-workers of the school staff.'

'Is yours a free school?' I asked, my mind reverting to the troubles of South Lancashire, and to the recent decision of the Bolton School Board to 'free' each of its schools as their new school year opens.

'No; we charge a penny to all the standards. We provide about thirty "free" places. You see the voluntary system is at a disadvantage here, as everywhere. "Freeing" our school meant a loss of £70 per annum in fees; and this, I may tell you, entailed the loss of another £70 in Government grants under the 17s. 6d. limit. With £140 to the bad, we could not go on. The sponge would have to go up! And we therefore decided, as I have said, to try the penny fee. So far the plan has been successful, although I can clearly see that it can't long survive the Board's recent decision.'

'How has the abolition of the fee affected the attendance of the pupils?' I queried. 'Do they now come more regularly?'

'By no means,' he replied, 'I never anticipated for a moment that the freeing of the schools would do away with the need for compulsion in this direction. The parents who give trouble will be influenced only by the strong arm of the law, or a direct appeal to their selfishness. I believe that an "attendance" qualification in lieu of the present "standard" qualification would do much to improve regularity of attendance.'

'Does your agitation against half-time affect your school in any way?' I suggested.

'Well!' said he, 'when I gave evidence before the Labour Commission I certainly got a few hard knocks. Yes,' replied he, anticipating me'; 'and I gave a few! During the debate on the Factory Acts Amendment Act—over which, you well remember, the Government "went down" last June—I wrote over a hundred letters to the Press. I went and addressed the Bolton Trades Council, which consists entirely of operatives, and I never spared the operatives for their selfishness. Yet I don't believe I suffered a single iota. So long as you hit fair, I believe in Lancashire you'll get fair play. I am convinced we should be nearer the end of the half-time system if teachers had had more courage, and less timidity, in dealing with the question. Well, I do receive some curious epistles from all sorts and conditions of persons. Here is one from a working man, in which he says:—

'"Allow me to thank you most sincerely for your efforts on behalf of the young people, and more especially the children, against the tyranny and selfishness of their parents and guardians, and the truckling of professed trade leaders. Your arguments and protests are the things just needed."

'After I gave evidence before the Commission, the Right Hon. A. J. Mundella, M.P., wrote to me:—

'"You have fully redeemed your promise. Pray accept my thanks and congratulations on the valuable evidence which you gave to the Royal Commission on Saturday last."

'Mr. Tom Mann says:—

'"I am sure you have rendered valuable service to the working community, by taking the trouble you did to prepare and give the evidence."

'The Rev. F. F. Cornish, M.A., Senior Inspector (who has had sixteen years' experience in the half-time district), wrote:—

'"I cordially agree with what you said, and it is evident to me from his remarks that the chairman—no bad judge of such matters—was very favourably impressed by it. If one had not lived so many years in the world, one might hope that the pleasant fiction of half-time being educationally good for children had received its quietus; but such things are very tenacious of life."'

'I see you have been able to find time, like most of you busy men, to make a good deal of homely apparatus for teaching aids. Tell me about these boards hanging in front of each class, will you?'

'Certainly; they contain the record of each child at each monthly examination. This, as you see, is a model of the school made to scale. You will observe that each story is made to "take off" like the doll's clothes. Those blackened maps? Oh! yes; they are the disabled maps furbished up with blackboard renovator so as to take chalk. They are fine for test-

ST. JAMES' NATIONAL SCHOOLS, BOLTON (MIXED DEPARTMENT).—TIME TABLE.

Day	Class	8.55—9.5	9.5—9.35	9.35—10.25	10.25—10.50	10.50—11	11—11.30	11.30—12	1.50—2	2—2.40	2.40—2.55	2.55—3.20	3.20—3.30	3.30—4	4—4.30	4.30—4.35
MONDAY	VI.	Assembly and Prayers	Writing. Catechism	Arithmetic	Geography	Recreation	Drawing for Boys Sewing for Girls		Assembly and Grace	Arithmetic	Ment. Arith.	Object Lesson	Recreation	Reading	Writing	Prayers and Dismissal
	V.			Arithmetic	Geography					Arithmetic	Ment. Arith.	Object Lesson		Reading	Writing	
	IV.			Arithmetic	Grammar					Arithmetic	Ment. Arith.	English		Object Lesson	Composition	
	III.			Arithmetic	Geography					Arithmetic	Ment. Arith.	Geography		Object Lesson	Composition	
	II.			Arithmetic	English					Arithmetic	Ment. Arith.	English		Object Lesson	Composition	
	I.			Arithmetic	English					Arithmetic	Ment. Arith.	English		Object Lesson	Composition	
TUESDAY	VI.	Assembly and Prayers	Old Testament	Arithmetic	English	Recreation	Reading	Writing	Assembly and Grace	Arithmetic	Ment. Arith.	English	Recreation	Reading	Writing	Prayers and Dismissal
	V.			Exam.	Exam.		Reading	English		Arithmetic	Ment. Arith.	English		Reading	Writing	
	IV.			Arithmetic	Geography		Reading	Writing		Arithmetic	Ment. Arith.	Geography		Reading	Writing	
	III.			Exam.	Exam.		Reading	English		Arithmetic	Ment. Arith.	English		Reading	Writing	
	II.			Arithmetic	Geography		Reading	Writing		Arithmetic	Ment. Arith.	Geography		Reading	Writing	
	I.			Arithmetic	Geography		Reading	Writing		Arithmetic	Ment. Arith.	Geography		Reading	Writing	
WEDNESDAY	VI.	Assembly and Prayers	New Testament	Exam.	Exam.	Recreation	Reading	Geography	Assembly and Grace	Arithmetic	Ment. Arith.	Geography	Recreation	Reading	Singing	Prayers and Dismissal
	V.			Arithmetic	Geography		Reading	Writing		Arithmetic	Ment. Arith.	Geography		Reading	Singing	
	IV.			Exam.	Exam.		Reading	English		Arithmetic	Ment. Arith.	English		Reading	Singing	
	III.			Arithmetic	Geography		Reading	Writing		Arithmetic	Ment. Arith.	Geography		Reading	Singing	
	II.			Exam.	Exam.		Reading	English		Arithmetic	Ment. Arith.	English		Reading	Singing	
	I.			Exam.	Exam.		Reading	English		Arithmetic	Ment. Arith.	English		Reading	Singing	
THURSDAY	VI.	Assembly and Prayers	Prayer Book	Revision of Back Rules in Arithmetic	Tonic Sol-fa	Recreation	Reading	Writing	Assembly and Grace	Drawing for Boys. Sewing for Girls to 4.30			Recreation	Reading	Writing	Prayers and Dismissal
	V.				Tonic Sol-fa		Reading	Writing						Reading	Writing	
	IV.				Tonic Sol-fa		Reading	Writing						Arithmetic	Geography	
	III.				Tonic Sol-fa		Reading	Writing						Arithmetic	Geography	
	II.				Tonic Sol-fa		Map Drawing	Map Drawing						Algebra	Algebra	
	I.				Tonic Sol-fa		Map Drawing	Map Drawing						Algebra	Algebra	
FRIDAY	VI.	Assembly and Prayers	Catechism	Arithmetic	English	Recreation	Reading	Writing	Assembly and Grace	Arithmetic	Ment. Arith.	English	Recreation	Reading	Writing	Prayers and Dismissal
	V.			Arithmetic	English		Reading	Writing		Arithmetic	Ment. Arith.	English		Reading	Writing	
	IV.			Arithmetic	Geography		Reading	Writing		Arithmetic	Ment. Arith.	Geography		Reading	Writing	
	III.			Arithmetic	English		Reading	Writing		Arithmetic	Ment. Arith.	English		Reading	Writing	
	II.			Arithmetic	Geography		Paraphrasing	Writing		Arithmetic	Ment. Arith.	Geography		Reading	Writing	
	I.			Arithmetic	Geography		Paraphrasing	Writing		Arithmetic	Ment. Arith.	Geography		Reading	Writing	

Manual Instruction (Boys)—Monday, 9.30 to 12.

Registers Closed at 9.50 a.m. and 2.15 p.m.

(Signed) R. WADDINGTON.

Approved on behalf of the Education Department as fulfilling the requirements of Section VII. of the Elementary Education Act, 1870.
February 27th, 1889.
F. F. CORNISH, Her Majesty's Inspector.

ing purposes, as you may imagine. That? Why that's our table-chart,' says Mr. Waddington, referring to two rows of figures on the back of one of the maps. 'See! this is the idea,' and in a couple of minutes a Standard I. had shown me all about the skilful manipulation of figures, under their master's scientific guidance.

'Who did *these* maps?' I asked, referring to three small maps, wonders of neatness and accuracy.

'Ah!' replied Mr. Waddington. 'They are the work of one of my pupil teachers now in Battersea. He was a splendid fellow—and is now, for that matter. He won the prizes regularly in the Educational Journal competitions. I wish I could get him back here again.'

'By the way, you seem to be here, there, and everywhere just now,' said I, referring to Mr. Waddington's Union activity.

'True,' replied he, 'I *am* pretty well occupied. I am just completing a set of drawing charts, and in my bag there I have the proofs of a little book on the Metric System, which is to be accompanied by descriptive charts. As you probably know, I regularly contribute to the *Schoolmaster* and the *Teachers' Aid*, and, of course, "Notes and Notions," month by month, to the PRACTICAL TEACHER. Last week, I may say, I wrote articles to the local papers on "Superannuation," "Juvenile Labour," "Extraneous Duties," and "The Supply and Pay of Teachers." What with the Executive and deputations I have not had a Saturday at home since Midsummer.'

'What is your experience of Executive Work?' I ventured to question.

'The journey is the killing part,' he rejoined. 'I leave school at 4.15 p.m. on Friday after a week's downright hard work, and rush off to catch the 4.28 p.m. to St. Pancras, arriving there at 9.50 p.m. I sometimes go up to Russell Square straight off, and sit through the tail-end of the last committee meeting for the night, which now and then runs into the eleventh hour. Of course I am at the offices all day Saturday, and as the work is not finished in time for me to return on Saturday night, I most times stay over-night, and get home at 10 p.m. on Sunday night, ready for another week's work on the morrow morning.'

'Severe? Yes! but I like it. When I begin to feel like talking about being a martyr, I'll give it up!'

'Ah! you are an enthusiast in Union work,' I reminded him.

'Oh, well, if you like, although I should hardly have put it that way. I am certainly proud of being on the Executive. Yes, I get a lot of local work as well; I have attended every meeting of the Bolton Association during this year, and every one of some nineteen committee meetings we have held. Into the bargain, I was up to two months ago President of the Half-time Council. When the present Technical School was being floated I represented the teachers on the Provisional Committee. By the bye, I forgot to tell you that I send the "Full-timers" in the upper standards for manual instruction to this Technical School every Monday morning. True, so permeated is my school with Half-timers I can only muster a dozen; but I understand that this is above the average in other schools similarly situated.'

'Yes, as you suggest, that is the right form of Half-time—half-time in school, and half-time in the Technical School,' said he, again anticipating my question 'The Technical Instruction Committee offer to instruct our boys gratis, and give the managers half the grant. I look to this, since the boys delight in the work, to wean both the parents and the children from the more baneful form of "Half-time."'

'Well, Mr. Waddington, I must leave you, if I am successfully to emulate your Friday afternoon rush, and catch the 4.28 for the South. I think I may assure you that teachers everywhere are watching your gallant struggle in the interests of the "kiddies," as Ben Tillett calls them, and I am sure I may wish you in their name every measure of success in your efforts.' And with a hearty grip of the hand, and a cheery 'Good-bye!' I was scurrying back to the station, with my mind full of many thoughts and quiet reflections.

—o—

MAY POLE DANCE.

BY THE AUTHOR OF 'FAN DRILL.'

General Observations.

ANY number of children divisible by four, but consisting of half boys and girls may be engaged in this dance.

Three circles are required, one as close to the pole as will hold all the children standing close together; the other two will depend upon the length of braids, the outer one enabling the children to skip round and hold the braid straight, while the other is distant about eighteen inches nearer the pole.

If the braids are only red, white, and blue much confusion will be avoided. Each boy has a 'white,' and each alternate girl a 'red' and 'blue' braid. Half of the braids will thus be white, a fourth blue, and a fourth red.

The children must stand at equal distances from each other, and it is as well to have a definite mark for each child, with a number, which it retains all through the exercise.

The children find their partners, and together, at a given chord, begin tripping to tune; at signal from teacher they proceed tripping up the room to circle, and once round, stopping before their own mark or number, but continue tripping step until the tune ends.

1ST PRACTICE.—2nd Figure. Original *Lancers*.

Ready: At first chord boys step four in and four out, bringing their own and partner's braid. Second chord, boys turn to right, holding loop or handle of braid in right hand and slipping the left hand as high up the braid as they can reach conveniently; girls left turn and hold braids in a similar manner, but in reverse hands. Teacher counts one, two, three, four, and at first note boys pass under girls' braid, then both boys and girls dance in and out, letting their braids pass over and under each other, until the tune has been played through a certain number of times, or until they meet their own partner the second time; they then face, and continue stepping to end of tune. At the command 'Change,' each child reverses its original position and braid, boys taking 'left' turn, girls 'right,' and dance in and out twice round until their places and numbers are regained.

2ND PRACTICE.—Tune and words from 'Children's Revels.' Trio, C and D. By Berkley Score.

Girls hand their braid to partner, who remains standing at their figure.

Ready: Both boys and girls sing, but only girls perform the actions. First line stoop with arms in a semi-circle, as if raising something from the ground. Second line polka four steps and face partner on inner circle, at the same time hands joined over head as a garland. Repeat these four steps for third, fourth, fifth, sixth, and seventh lines, but at the end of each line pause, face partner, and bow. Eighth polka back to figure, all join hands (boys and girls), and swing them to ninth and tenth lines. The boy then takes the girl's right hand and gently swings her to the inner circle in front of him, and during the singing of eleventh and twelfth lines they bow to each other. Thirteenth and fourteenth and fifteenth lines, girls skip to pole and bend down on one knee, face partner, elbow on knee and head sideways on hand. Sixteenth line skip to places, all join hands, and skip round the circle twice to tune.

3RD PRACTICE.—Tune: 'The Lucien Hall.' By A. L. Cowley.

Ready: Girls step to inner circle and 'right' turn, boys remain on outer circle and 'left' turn. Boys remain standing until the girls have been once round. Girls Polka, step in and out each other, plaiting their ribbons, beginning blue under, red over, as the teacher counts four. When the girls have been once round the circle, the boys plait with each other, the girls still continuing their plait and each going on until the braids are plaited as far as they can be, or until the partners meet the second time. This exercise forms a blue and red plait close to pole with a white one over it.

This is rather a difficult exercise for young children, but if taken slowly, with teacher telling the colour to advance, as 'red under,' 'blue under,' it can be mastered in one lessen by children five years old.

4TH PRACTICE.—Tune: 'The White Cockade.' By A. L. Cowley.

Ready: Boys take both braids, and join hands (empty ones), holding them high enough for girls to pass under, girls trip to pole and stand facing the boys. Teacher counts four, then girls trip from pole two together through boys' arms, passing behind own partner back again to pole and bow, the boys also bowing. Repeat twice through tune.

5TH PRACTICE.—Tune: 2nd Figure, Original *Lancers*.

Ready: Girls advance and take boy's arm; even numbers 'right' turn, odd 'left' turn, both keeping together. The child to the outside of circle, whether boy or girl, holds the ends of both braids; the inner child holding higher up both together. In this way they skip in and out round the pole, as in the grand chain, pausing to slightly bow to meeting partner at each bar of the music.

6TH PRACTICE.—Tune: 'The Flowers that Bloom.'—*Mikado Lancers*.

Ready: Each child holds braid in right hand, each four children (two boys and girls) making a separate figure with their braids.

Teacher counts; second and third twist round twice, stepping to tune, then first and second together, and third and fourth together twice, then second and third again, and so on until a series of diamonds has been formed, keeping step until end of tune. All now sit on floor gipsy fashion and may sing any easy chorus.

7TH PRACTICE.—Tune: 'Gin a Body,' with words, first verse.

Ready: Boys take both braids, while girls lightly hold dresses at each side and skip in and out to tune, pausing and stooping before each boy; the second time round perform suitable actions—saluting, throwing a kiss, crying, etc.—until they reach their place again. The boys remain at their place keeping time and bowing to each girl as she meets him.

8TH PRACTICE.—Tune: 'See me Dance' *Polka*.

Ready: Children drop braids and form couples. Teacher counts one, two, three, then all polka once round the ring and down the room to class-room.

—o—

SCHOLARSHIP FRENCH.

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NOTES AND VOCABULARY TO 'LA JEUNE SIBÉRIENNE.'

[*N.B.—The rules referred to will be found in the* PRACTICAL TEACHER *for September*, 1892.]

30.1.—*navrée*, heart-broken, past part., fem., sing. of *navrer*, wound, distress.

30.1.—*surtout*, especially (lit. 'above all').

30.2.—*provenaient* impf. ind., 3 pl. of *provenir*, proceed.

30.3.—*l'on*. The indefinite pronoun *on* (one, people) is preceded by *l'* when it follows *et*, *que*, *ou*, *si*.

30.4.—*qu' avait produit*. The subject is *l'exhibition* in line 6; *qu'* is the object.

produit, past part. of *produire*, produce.

30.5.—*nous venons de parler*, we have just spoken.

Venir de foll. by inf. = to have just.

30.7.—*le*, it (*i.e.* the passport). The vb. *montrer* immediately follows *le*, thus pointing it out as the pronoun used as direct object.

30.9.—*y*, in it (*i.e.* the passport).

30.9.—*qualifiée de*, described as.

30.10.—*fille de capitaine*, (the) daughter of (a) captain.

30.11.—*ce qui*, a circumstance which. *Ce qui* is used in this way to represent the idea contained in the preceding sentence.

30.13.—*lui était arrivé*, had happened to her. A very frequent use of *arriver*. Notice *était* (and not *avait*) with *arriver*. This is also the case with *aller*, *rester*, *tomber*, *venir*, *sortir*, *partir*, *naître*, and their compounds.

30.13.—*tandis que*, whilst, whereas. Used when two affirmations are contrasted with each other.

30.15.—*éprouvés*, past part., masc., pl. of *éprouver*, experience.

Past part. is masc., pl. by Rule D. The dir. obj. is *que* (= *traitements*).

30.16.—*On s'imagine*, people think. *S'imaginer*, to take into ones head, fancy, think.

30.20.—*lesquels*, which. It is used because it translates 'which' following a preposition. Notice particularly, it is masculine plural. It = *embarras* (m. pl.), and *peines* (f. pl.), but agrees with the former as it is nearer to it.

30.20.—*je me suis trouvée*, lit. 'I have found myself.
Translate 'I have suffered.'

30.20.—*que* = *lorsque*. To repeat a conjunction introducing a subordinate sentence, use *que*.

30.21.—*dits*, pres. indic., 1 sing. of *dire*, say.

30.21.—*gîtes*, noun, masc., pl., lodgings.

30.25.—*Il en est une*. There is one (lit. of them = *en*, *i.e.*, *situations*).
The verb *to be* is often used in this impersonal sense.

30.26.—*crut*, pret., ind., 3 sing. of *croire*, believe.

30.28.—*le long des maisons*, alongside the houses.

30.28.—*pour chercher*, to seek. *Pour* is used because a purpose is denoted.

30.30.—*venait de lui refuser*, had just refused her. See note on 30.5.

30.31.—*très-durement*, very harshly. Notice that *très* is joined to the adv., or adj., it qualifies by a hyphen.
Adverbs of manner are often formed by adding *ment* to the *feminine* of an adjective. The reason why it is added to the feminine is that *ment* was originally a feminine noun, meaning 'manner,' and was therefore joined to a feminine adjective. *Durement* means, according to its etymology, 'in a harsh manner.'

30.32.—*suivit*, pret., indic., 3 sing. of *suivre*, follow.

30.32.—*C'était*, he was. This form is used when a noun or pronoun follows the verb *être*.

30.33.—*de très mauvaise mine*, very evil-looking. *Mine* (our word *mien*), usually refers to health. *Avoir bonne mine* = to be in good health.

30.35.—*se laissa conduire*, allowed herself to be led. Notice again how the French use an active where we use a passive.

30.36.—*craignant*, pres. part. of *craindre*, fear.

30.36.—*de ne pas obtenir*, not to (be able to) obtain.

31.2.—*soigneusement*, adv., carefully (*soigneux*, careful, from *soin*, care). See 30.31.

31.3.—*guichets*, noun, masc., pl.; shutters. *Guichet* is our word *wicket*. Following the law of consonantal change, many of our words commencing with *g* are represented in French by words commencing with *w*. Compare warren, *garenne*; war, *guerre*; wasp, *guêpe*; William, *Guillaume*.

31.5.—*lui firent peu d'accueil*, lit. 'made her little reception,' i.e., received her coldly; *firent*, pret. ind., 3 pl. of *faire*, make.

31.8.—*se repentait de s'être arrêtée*, lit. 'repented herself of having stayed.' Translate 'repented having stayed,' *s'arrêter*, to remain, stay.

31.9.—*asseoir*, to sit down.

31.10.—*esquilles*, noun, fem., pl., splinters, chips.

31.11.—*sapin*, noun, masc., sing., fir, fir-tree.

31.12.—*muraille*, noun, fem., sing., wall.

31.13.—*à la clarté lugubre*, *by* the gloomy light. *A* = by, here as in 32.45.

31.15.—*se hasardait*, ventured. *Se hasarder* = to venture. The *e* of *se* is not elided here, as the *h* of *hasarder* is aspirated.

31.19.—*la vieille*, the old (woman). Nouns are much more frequently understood after adjectives in French than in English.

31.20.—*vais*, pres. ind., 1 sing. of *aller*, to go.

31.26.—*Il ne me reste que*, there only remain to me, i.e., 'I have left but.' See 30.25 for another instance of this impersonal use of *être*.

31.28.—*mens*, pres. ind., 2 sing. of *mentir*, lie.

31.29.—*On ne se met point en route*, lit. one does not put oneself on road. Translate 'people do not set out.'

31.31.—*La jeune fille avait beau protester*, The young girl in vain protested.
Avoir beau, foll. by inf. = 'to be in vain.'
It is like our ironical expression, 'It is *all very fine* for you to protest.'

31.32.—*c'était là tout son avoir*, lit. 'it was there all her possession.' Translate 'that was all she had.'
Notice *avoir* is a noun here = belongings.

31.32.—*croyait*, imperf., ind., 3 sing. of *croire*, believe.

31.33.—*ricanait*, imperf., ind., 3 sing. of *ricaner*, chuckle, titter.

31.36.—*vraiment*, truly (in an ironical sense). It = our word 'indeed!'
Notice that *-ment* is added to the *masculine* of the adj. here by exception. See note on 30.31.

31.38.—*tout bas*, lit. quite low, *i.e.* 'silently.'

31.40.—*dès que*, as soon as.

31.47.—*en partie*, partly.

31.48.—*avant de*, before, when preceding a gerundial infinitive

32.1.—*poêle*, noun, masc., sing., stove.
le poêle, also = pall, canopy.
la poêle, = frying-pan.

32.2.—*en bas*, downstairs. Here simply 'below.'
en haut, upstairs, above.

32.2.—*portée*, noun, fem., sing., reach.

32.5.—*s'épargner*, to spare *to* herself.

32.7.—*crurent*, pret., ind., 3 pl., believe.

32.8—*endormie*, past. part., fem. sing. of ob. *endormir*, to send to sleep. Translate 'asleep.'
But *s'endormir* = 'to fall asleep.'

32.12.—*assignations*, noun, fem., pl., paper-money.

32.13.—*auquel*, to which (*à lequel* = *un cordon*).

32.13.—*pend*, pres. ind., 3 sing. of *pendre*, hang.

32.15.—*toile*, noun, fem., sing, cloth. *Cirée*, past part., fem., sing. of *cirer*, to wax.
toile cirée, oil-cloth.

32.16.—*contenant*, pres. part. of *contenir*, contain.

32.18.—*Ils se mirent à parler*, lit. 'they put themselves to talk.' Translate 'they began to talk.' *Se mettre à* = to begin.
mirent, pret., ind., 3 pl. of *mettre*, put.

32.18.—*de temps en temps*, from time to time. So *d'heure en heure*, from hour to hour.

32.20.—*vue*, past part., fem., sing. of *voir*, see. Part. is fem., sing. by Rule D (*l'* = *Prascovie*).

32.21.—*misérables*, adj., masc., pl., wretched. Here used as a noun = 'wretches.' See 31.19.

32.21.—*on ne se doute pas même qu'elle soit*, no one even suspects that she is. *Se douter* = to suspect. Subj. by Rule F (2).

32.25.—*peignait*, imperf., ind., 3 sing. of *peindre*, paint.

32.27.—*vit*, pret., ind., 3 sing. of *voir*, see.

32.27.—*tout à coup*, suddenly.

32.28.—*grimpait*, imperf., ind., 3 sing. of *grimper*, climb.

32.29.—*se glaça*, lit. froze itself. Translate 'froze.'

32.33.—*sans lui répondre*, without answering her (lit. 'to her'). *Répondre* is followed by *à*.

32.34.—*se mit à*, began to. See 32.18.
mit, pret., ind., 3 sing. of *mettre*, put.

32.35.—*qu'elle lui fit ôter*, which she made her take off. See note on 27.13.

32.38.—*couple*, noun., masc., sing., couple.
le couple, a pair of animated beings acting in concert; a pair of animals (male and female).
la couple, a couple (two things of the same kind).

32.39.—*ses recherches*, lit., 'its search.' Translate 'their search.' *Ses* is used here, and not *leurs*, because a singular word (*couple*), is referred to.

32.43.—*de la voir se renouveler*, of seeing it renewed (lit. 'renew itself').

32.44.—*tinrent*, pret. ind., 3 pl. of *tenir*, hold; keep.

32.45.—*reconnut à*, recognised by. See note on 31.13.
reconnut, pret., ind., 3 sing. of *reconnaître*, recognise.

32.46.—*bruyante*, adj., fem., sing., noisy.

32.46.—*s'étaient endormis*, had fallen asleep. See 32.8.

32.47.—*peu à peu*, little by little; gradually.

33.1.—*l'emportant*, gaining the victory (lit., 'carrying it off').

33.3.—*grand jour*, broad daylight.

33.4.—*réveilla*, pret., ind., 3 sing. of *réveiller*, awake.

33.5.—*de lui trouver—plus naturel*, lit. 'to find to her, as well as to her husband, a look more natural.' Translate 'to find that she, as well as her husband, had a more natural look.'

33.8.—*retinrent*, pret., ind., 3 pl. of *retenir*, detain.

33.9.—*en fit aussitôt les préparatifs*, immediately made preparation for it (lit. 'of it' = *en*).

33.11.—*la veille*, the evening before. Our word *vigil* is from the same root.

33.12.—*prit.*, pret., ind., 3 sing. of *prendre*, take.

33.13.—*pot au stchi*, the stchi pot. *Stchi* is the name of a Russian dish.

The purpose for which anything is used is denoted in French by joining the noun denoting that purpose to the name of the implement or utensil by the preposition à. For example :—

Pompe à incendie, fire-engine.

Pot à thé, tea-pot.

33.15.—*soulevait*, impf., ind., 3 sing., of *soulever*, raise.

33.16.—*plancher*, noun, masc., sing., floor.

33.16.—*seau*, noun, masc., sing., pail, jug.

33.18.—*Cruche*, noun, fem., sing., mug, jug. Our Biblical word *cruse* is from the same root.

33.21.—*d'y prendre intérêt*, of taking (an) interest in it.

33.26.—*mal à propos*, unjustly.

33.27.—*voleuse*, noun, fem., sing., thief.

33.30.—*Congé*, noun, masc., sing., leave.

33.31.—'*Ne sachant trop si*,' lit. 'not knowing too well whether.' Translate 'being uncertain whether.'

sachant, pres. part. of *savoir*, know.

33.37.—*surpris*, past part., masc., sing. of *surprendre*, surprise.

33.37.—*qu'elle le fut elle—même*, as she was herself. Lit. as she was *it* herself (*le* = *it*, *i.e.*, the fact of her being surprised).

33.38.—*en apprenant*, on learning, finding.

apprenant, pres. part. of *apprendre*, learn.

33.39.—*qu'elle croyait avoir*, lit. 'which she believed to have.' Translate 'which she thought she had.'

33.40.—*elle en trouva cent vingt*, she found one hundred and twenty (of them. Do not translate *en*).

33.46.—*courut*, pret., ind., 3 sing. of *courir*, run.

34.1.—*traite*, noun, fem., sing, stage, journey.

34.2.—*partit*, pret., ind., 3 sing. of *partir*, set out.

34.6.—*entourèrent*, pret., ind., 3 pl. of *entourer*, surround.

34.7.—*ce qui ne fit qu' augmenter leur rage*, which only increased their rage.

Ne faire que = to do nothing but, as

Il ne fait que sortir et rentrer, he does nothing but go in and out.

34.9.—*bas*, noun, masc., sing., bottom.

34.10.—*déchira*, pret., ind., 3 sing. of *déchirer*, tear.

34.14.—*flairer*, verb, inf., sniff at, smell.

34.15.—*orage*, noun, masc., sing., storm, tempest.

34.17.—*ne lui firent aucun mal*, did no harm to her. *Ne—aucun* = the adj. 'no.'

34.21.—*retenue*, past part., fem., sing. of *retenir*, detain.

34.21.—*près de*, nearly. But *prêt à*, ready to.

34.21.—*huit jours*, (lit. eight days) a week. The French make *eight* days by reckoning the day on which the week begins, and the day on which it ends.

So a fortnight is *quinze jours* (lit. fifteen days).

34.22.—*était tombée*, had fallen. See 30.13.

34.24.—*piétons*, noun, masc., pl., pedestrians, foot passengers. From *pied*, foot.

34.25.—*suffisamment*, adv., sufficiently. Adjs., in *ant*, and *ent* form their adverbs of manner by changing *nt* into *mment*.

34.26.—*traîneaux*, noun, masc., pl., sledges. From *traîner* to draw.

34.29.—*l'en dissuadèrent*, dissuaded her from it.

34.29.—*lui en firent voir le danger*, madé her see the danger of it. See note on 32.35.

34.31.—*devint*, pres. ind., 3 sing. of *devenir*, become.

34.33.—*périraient*, condit., 3 pl. of *périr*, perish.

34.33.—*égarés*, past part., masc., pl. of *égarer*, lose.

34.38.—*convoi*, noun, masc., sing., train.

34.38.—*conduisaient*, impf. ind., 3 pl. of *conduire*, lead, carry.

34.40.—*Noël*, noun, masc., sing., Christmas.

34.43.—*braves*, adj., fem., pl., honest, good, kind. When it follows its noun it means 'brave.'

34.43.—*prenaient*, imperf. ind., 3 pl. of *prendre*, take.

34.45.—*assortis*, past part., masc., pl. of *assortir*, suit.

34.45.—*bien de la peine*, much difficulty. *Bien* is followed not only by *de*, but also by the article.

34.47.—*nattes*, noun, fem., pl., mats.

35.2.—*devint*, pret., ind., 3 sing. of *devenir*, become.

35.3.—*journée*, noun, fem., sing., day's journey.

So *soirée* is the duration of the evening (*soir*).

35.4.—*transie*, past. part., fem., sing. of *transir*, benumb.

35.7.—*auberge*, noun, fem., sing., inn. Notice when a noun is used in apposition, as here, it has no article.

35.7.—*plus de*, more than. *Plus* is followed by *de* when a numeral follows.

35.9.—*où se trouvait—chevaux*, lit. 'where found itself the station of the horse-post.' Translate 'where the posting-house stood.'

When *où* commences a sentence, the subject is placed after the predicate.

For *poste aux chevaux* see 33.13.

35.10.—*s'aperçurent*, pret., ind., 3 pl. of *s'apercevoir*, perceive.

35.11.—*joue*, noun, fem., sing., cheek.

35.11.—*gelée*, past part., fem., sing. of *geler*, freeze.

35.11.—*la lui frottèrent*, rubbed it for her.

35.17.—*par un froid si vif*, in a cold so keen.

Notice this idiomatic use of *par* in speaking of the weather.

35.20.—*amèrement*, adv., bitterly.

35.20.—*prévoyant*, pres. part. of *prévoir*, foresee.

35.22.—*d'autres bonnes gens*, such kind people.

Notice that the adj. before *gens* is feminine. The rule is that an adj. used before this word must be feminine, and an adj. used after it masculine.

35.23.—*d'autre part*, on the other hand.

35.24.—*paraissaient*, impf. ind., 3 pl. of *paraître*, appear.

35.24.—*du tout* at all.

35.25.—*voulurent*, pret., ind., 3 pl. of *vouloir*, wish.

35.25.—*à toute force*, with all their might ; very much.

35.26.—*partît*, impf., subj., 3 sing. of *partir*, set out. Subj. by Rule F. (4).

35.28.—*déçue*, past part., fem., sing. of *décevoir*, dissappoint, deceive.

35.31.—*coin*, noun, masc., sing., corner.

35.34.—*se cotisèrent*, pret., ind., 3 pl. of *se cotiser*, to club together ; contribute equally. Our word *quota* is from the same root as *cotiser*.

35.35.—*il ne s'en trouva point à vendre*. The construction of this sentence is peculiar.

Il se trouva = there found themselves (impersonal use of *il*) = there were.

Il ne se trouva point = there were not.

Il ne s'en trouva point = there were not any ; *à vendre*, to sell.

35.42.—*jusqu'à*, as much as.

35.45.—*un expédient des plus singuliers*, lit. 'an expedient of the most singular ;' *i.e.*, 'a most singular expedient.'

36.2.—*permit*, pret., ind., 3 sing. of *permettre*, permit.

36.2.—*profiter de* = profit *by*. Notice the *de* which follows *profiter*.

36.4.—*tour à tour*, turn by turn, by turns.

36.5.—*prendra*, fut., 3 sing. of *prendre*, take.

36.5.—*une fois pour toutes*, lit., one time for all (times) ; once for all.

36.11.—*veulent savoir leur compte*, lit., wish to know their reckoning, *i.e.*, are precise in their bargains.

Veulent, pres. ind., 3 pl. of *vouloir*, wish.

36.11.—*se laissent difficilement tromper ; se laissent*, allow themselves *difficilement*, with difficulty (*we have no adv. corresponding to adj.* '*difficult*') ; *tromper*, to be deceived. (*Active used instead of English passive.*)

36.16.—*cédée*, past part., fem., sing. of *céder*, to give up.

Fem., sing., by Rule D (*la* = *pelisse* is the dir. obj.)

36.16.—*couvrit*, pret., ind., 3 sing. of *couvrir*, cover.

36.17.—*dont elle s'était servie*, which she had used.

Se servir de (*quelque chose*) = to use.

36.17.—*jusqu' alors*, up till then.

36.18.—*s'asseyant*, pres. part of *s'asseoir*, to sit.

36.19.—*Chanter à tue-tête*, means lit. to sing (loud enough) to kill the head (*tuer*, to kill; *tête*, the head).

Translate 'sing at the top of his voice.'

36.20.—*se fit*, lit. 'made itself'; was made.

36.21.—*poteau*, noun, masc., sing., post, stake; *poteau des verstes*, verst post; so we say 'mile-stone.'

36.22.—*parvint*, pret., ind., 3 sing. of *parvenir*, arrivé.

36.24.—*ne cessa*, did not cease. *Cesser*, like *oser*, *pouvoir*, *savoir*, does not require *pas* to complete the negation.

36.25.—*pour que*, lit. 'for that.' Translate 'that.' *Pour que* requires subj. after it. Rule F (5).

36.26.—*souffrît*. (*Notice the circumflex, which, by a printer's error, is omitted in Darqué's edition*); impf., subj., 3 sing. of *souffrir*, to suffer.

36.33.—*d'après*, in accordance with; from.

36.34.—*lui fit aussitôt—les plus généreuses*, lit. 'made to her at once the enumeration of the persons in the town (*de* = in) who passed for being the most generous.'

Translate 'gave her at once a list of the persons in the town who had the reputation of being the most charitable.'

36.37.—*s'adresser à elles*, apply to them. *Elles* is used because it stands for the fem. pl. word *personnes*.

36.40.—*loua*, pret., ind., 3 sing. of *louer*, to praise.

36.41.—*une dame Milin*, a (certain) Mrs. Milin.

36.43.—*dont la bonté*, lit. of whom the kindness; whose kindness.

37.1.—*Lors même que*, even if.

37.2.—*n'aurait pas*, would not have. Translate 'had not.'

37.2.—*compris*, past part. of *comprendre*, understand.

37.5.—*appelle*, pres. ind., 3 sing. of *appeler*, call.

37.8.—*hangar*, noun, masc., sing., shed.

37.9.—*toit*, noun, masc., sing., roof.

37.10.—*duquel* (= *de lequel*), of which.

37.10.—*une serre chaude*, now means 'a hothouse.' Translate 'a very warm room.'

37.13.—*peuvent*, pres. ind., 3 pl. of *pouvoir*, be able.

37.13.—*pièce*, noun, fem., sing., here means 'room.'

37.13.—*dont le plancher*, lit. 'of which the floor.' Translate 'the floor of which.'

37.14.—*sert*, pres. ind., 3 sing. of *servir*, to serve. *Servir de* = to serve as.

37.15.—*lit*, noun, masc., sing., bed.

37.15.—*le lendemain*, the next day.

37.16.—*d'assez bonne heure*, rather early. *De bonne heure* = early. The addition of *assez* gives the idea of 'somewhat,' 'rather.'

37.17.—*se rendre*, betaking herself.

37.18.—*suivant*, pres. part. of *suivre*, to follow.

37.20.—*où se trouvait plus de monde*, lit., 'where found themselves more people;' 'where there were more people.' Notice the placing of subj. after pred. when *où* commences a sentence. See 35.9.

Monde (lit. 'world,' L. *mundus*) = our words 'society,' 'company,' 'people.'

37.21.—*qu'elle n'en avait jamais ou rassemblé. Ne* is used because this sentence follows after, and depends upon a comparative (*plus*). Do not translate *ne*. *En* = of them (*i.e.*, of people) and should not be translated.

Translate 'than she had ever seen assembled.'

37.23.—*la fit autant remarquer*, made her as much remarked. Notice how our passive (*remarked*), is again represented by an active (*remarquer* = to remark). See 36.11.

37.25.—*étrangère*, adj., fem., sing., foreign.

37.28.—*satisfit*, pret., ind., 3 sing. of *satisfaire*, satisfy. *Satisfaire* is followed by *à*.

37.30.—*lui fit part de l'intention*, acquainted her with the intention.

Faire part à (someone) *de* (something) = to acquaint someone with something.

37.30.—*où elle était*, lit. in which she was. Translate 'which she had formed.'

37.33.—*appris*, past part. of *apprendre*, to tell.

37.35.—*d'une manière*, in a manner. 'In' before words denoting *manner*, *way*, is translated by *de*.

37.36.—*qui ne pouvait lui être suspecte de flatterie*, lit. 'which could not be to her suspected of flattery.' Translate 'which she could not suspect of flattery.'

37.37.—*avant de se faire connaître*, before making herself known. For *avant de* see 31.48. *Connaître* (to know) is another example of the active used instead of the English passive. See 36.11 and 37.23.

37.41.—*vante*, pres. ind., 3 sing. of *vanter*, praise. Our word is *vaunt*.

37.42.—*que vous l'imaginez*, lit. 'as you imagine it.' Do not translate '*l*.'

37.43.—*m'en croire*, lit. 'to believe me about it' (*en* = about it, and should not be translated).

(*Course of study for February.*)

1. Exceptions to rule for formation of plural of nouns and adjectives.

Which nouns ending in *ail* change this termination to *aux*?

Which nouns ending in *au* take *x* to form the plural?

2. Rule for the formation of feminine of adjectives. Exceptions to the rule.

3. How do verbs of the first conjugation ending respectively in *gen*, *cer*, and *yer* (like *diriger*, *avancer*, *appuyer*) deviate from the ordinary conjugation?

Examination Paper.

1. *Translate into English.*—Ses conducteurs *furent touchés* de sa situation; ils *se* cotisèrent pour lui acheter une pelisse de mouton, qui dans le pays ne *coûte* que cinq roubles; malheureusement il ne s'en trouva point à vendre; *aucun* des habitants de cette ville isolée ne voulut faire le sacrifice de *la sienne*, parce qu'il était difficile de la remplacer. Dans cette perplexité, un des plus jeunes conducteurs proposa tout à coup un expédient des plus singuliers et qui *permit* à Prascovie de profiter, de leur bonne volonté. Nous lui *prêterons*, dit il, tour à tour nos pelisses, ou bien elle prendra la mienne une fois pour *toutes*, et nous changerons entre nous à chaque verste.

2. Parse the words in italics.

3. Give the feminine of âne, maître, ours; the plural of nez, aïeul (*both forms*) and hibou; and the conditional tense of laisser, voir, connaître.

4. Write in French:—Six hundred and seventy-five. It is cold. I have been at school three years. I should prefer to remain indoors to write my letters. I am going to my aunt's on the 20th of next month.

ANSWERS TO JANUARY PAPER.

1. This scene was more calculated to discourage Prascovie from her plans than reproaches or harsh treatment. However, the humiliation she felt at seeing herself treated as a child soon vanished and no longer disheartened her. The ice was broken; she made fresh attempts on several occasions; and her prayers were soon so frequent and so tiresome that her father, losing patience, scolded her severely, and forbad her with severity to speak to him any more on the subject.

2. *etait*, impf., ind., 3 sing. of *être*, predicate to *scène*.

faite, past part., fem., sing. of *faire*, agreeing in gend. and numb. with *scène*.

mauvais, adj., masc., pl., agreeing with *traitements* in numb. and gend.

la, pers. pro., 3 sing., fem., accusative case; direct obj., governed by *découragea*.

fréquentes, adj., fem., pl., agreeing with *prières* in numb. and gend.

sérieusement, adv. of manner, from adj. *sérieux*, modifying vb. *gronda*.

lui, pers. pro., 3 sing., fem., dative case; indirect obj. to *défendit*.

défendit, preterite ind., 3 sing. of défendre, predicate to *père*,

3. *était* from vb. *être*.

Present je suis, tu es, il est; nous sommes, vous êtes, ils sont.

Preterite, je fus, tu fus, il fut; nous fûmes, vous fûtes, ils furent.

Future, je serai, tu seras, il sera; nous serons, vous serez, ils seront.

faite, from vb. *faire*.

Present, je fais, tu fais, il fait; nous faisons, vous faites, ils font.

Preterite, je fis, tu fis, il fit; nous fîmes, vous fîtes, ils firent.

Future, je ferai, tu feras, il fera; nous ferons, vous ferez, ils feront.

défendit from *défendre*.

Present, je défends, tu défends, il défend; nous défendons, vous défendez, ils défendent.

Preterite, je défendis, tu défendis, il défendit; nous défendîmes, vous défendîtes, ils défendirent.

4. *Pour décourager Prascovie.* *Pour* is used with an inf. mood because purpose is denoted.

Des reproches. *Des* is here the partitive article. The idea it conveys is '*some*' reproaches, not *all* the possible reproaches.

de mauvais traitements. *De* is the partitive article, conveying the idea expressed by *des* in the former phrase. *De* alone is used here, as the adj. *mauvais* precedes the noun.

de se voir traiter. The act. vb. *traiter* is used here when the idea is passive, because the French avoid the use of the passive wherever possible. The reflexive pronoun *Se* used as dir. obj. precedes the vb. *voir*, which governs it by the rule.

à plusieurs reprises. *Reprise* means 'renewal' or 'repetition.' The phrase means therefore 'on several fresh occasions.'

5. (*a*) Prascovié a-t-elle reçu son passeport? Non, car son père l'avait serré parmi ses hardes.

(*b*) Elle venait d'écrire une lettre.

(*c*) Le facteur lui remit une lettre cachetée. Il l'ouvrit, mais il n'y trouva pas de réponse à sa demande.

(*To be continued.*)

NEEDLEWORK FOR PUPIL TEACHERS.

BY MISS SOPHY LOCH,

Examiner of Needlework to the London School Board.

PUPIL Teachers in their second year are required to show to H. M. I. on the day of examination :—

1. An infant's nightgown or a child's frock, in mull muslin or print, showing all the stitches required in Standards VI. and VII.

2. A patch in calico, one in flannel, and one in print.

3. Patterns of a boy's shirt and a woman's nightgown drawn to scale ($\frac{1}{4}$ size) on sectional paper; quantity and quality of material to be stated.

4. A stocking.

I will first speak of the garments to be cut out and made up, and will begin with the infant's nightgown, which shows well all the stitches required—viz., sewing and felling, stitching, gathering, button-holing, sewing on a button, tucking, whipping, and (if desired) feather-stitching. An infant's nightgown, well-proportioned and daintily-worked, is a very attractive little garment, and well repays the labour spent upon it.

At the risk of repeating myself, I should like to briefly recapitulate one or two important points noted in a former article on the First Year Pupil Teacher Work, as to pattern, material, etc. First, as to pattern. I do not wish to suggest the superiority of one pattern over another, as opinions vary so much as to their respective merits, but would only say that the nightgown must be roomy and comfortable, especially in the armholes and sleeves, as the arms of the little wearers are seldom still, and the skin of a baby is so delicate that the least pressure irritates and chafes it. The neck must also be thoroughly easy in its fit. It is, perhaps, best to get a nightgown which has been proved and tested by constant wear, unpick it, and cut from that. If this plan does not commend itself to the worker, there are many excellent little books and diagrams published which would help much in choosing a pattern of this garment. The material chosen to make it must be soft and free from dress, and of a suitable width for the garment to be cut from it. It is, of course, better to cut more than one garment of a given kind at the same time, as one part cuts against another, and thus economy of material is effected. After the pattern is fixed upon and the materials provided, the next step is to tear off the two pieces of calico which form the body of the nightgown (taking care to leave proper allowance for the bottom hem), then the bands and sashes, and lastly, to cut out the little pair of sleeves.

The piece of calico from which the front of the nightgown is to be cut should be now doubled (lengthways), having previously been pulled perfectly straight so that the threads run as evenly as possible, the paper pattern pinned on, and the front cut out, making due allowance for small turnings if necessary. The shoulders, armholes and side slopes are first cut, and then the curve for the neck. The back of the nightgown should then be cut out in the same manner; with the addition of the back slit, which should be long enough to allow the garment to slip easily over the baby's head. The front and back of the nightgown can of course be cut out at the same time; but if this be done, it must be remembered the neck curves are not similar, that for the back not being cut so low as the front.

The garment is then made up in the following manner :—

1. The shoulders and side slopes prepared for sewing and felling. The seams must fall to the front and the fells to the back; that is to say, the shoulders and side slopes of the front of the garment are turned down *twice*, and those of the back *once*. Should a run and fell seam be desired, the garment must be prepared accordingly. The nightgown must be turned on to the wrong side, and the seams may be arranged thus :—

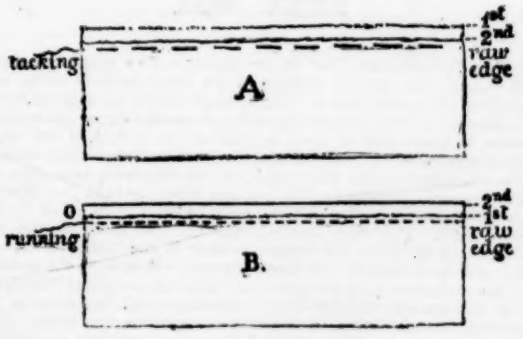
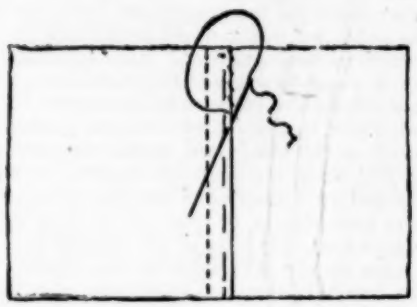


Fig. 50.

In Fig. 50 A the raw edge of one side of the garment is placed a little below the raw edge of the other, and the two are first tacked and then run together a little below the lower raw edge. After the running is completed, the top raw edge is turned down once, so as just to cover the lower raw

edge, as seen in Fig. 50 B. A second turning is then made, and the fold hemmed down as in Fig. 51.



O in Fig. 50 (B) turned over and prepared for hemming.

Fig. 51.

This method of arranging a run and fell seam prevents the possibility of any of the raw edge showing on the right side of the seam. The running must be begun on with one or two small stitches, not with a knot, and the stitches must be very even and regular. The running and hemming stitches must be of an uniform size.

2. The shoulders and side seams being finished, the next thing is to turn down, tack, and work the bottom hem.

3. The sleeves must now be made. They must be joined by a run and fell, or sew and fell seam, according to the manner in which the garment has been arranged, hemmed at the wrist on the wrong side, and turned back to form a little cuff. The sleeves are put into the armholes (which they exactly fit) by a run and fell seam, the fell to fall on to the garment; but this part of the work is not done until the whole nightgown is finished.

(To be continued.)

SCIENCE NOTES.

THE OBSERVATORY ON MONT BLANC.—Two years ago, when M. Janssen, the famous director of the Meudon Observatory, and member of the Institute of France, made the ascent of Mont Blanc in order to ascertain the practicability of establishing an observatory there, he found that at forty feet below the surface of the snow there was no bed of rock suitable for the foundations of a building. The old scientist, who was dragged up the mountain in a chair he had invented specially for this task, conceived the bold idea of constructing an observatory which could be kept in its place by the snow itself. The main building was built at Meudon after the designs of M. Eiffel, the famous inventor of the Eiffel Tower. It has now been sent off to Chamounix to be taken up to the summit of the mountain and put together under the supervision of M. Capus, the well-known explorer who accompanied M. Bonvalot in his journey through Central Asia and over the Pamir into India. The new observatory is constructed of timber, and is about twenty-five feet in height. It is to be divided into two storeys surmounted by a square platform with an iron balustrade and a wooden scaffolding for the reception of the various meteorological instruments of the observatory. The rooms, into which each storey is to be divided, are to be devoted partly to science, partly to hospitality. On the one side, they are for the use of the director of the observatory and his staff; on the other, for the service of tourists and their guides. Plain and barrack-like, they will be provided with anthracite stoves for heating and cooking purposes. The two storeys will have as a means of communication a spiral staircase, while a straight ladder with a trapdoor is to give access to the room for the guides. All the timber employed was covered with a thick coating of fireproof paint and carefully numbered before its transportation to Chamounix, whence it has to be carried up the mountain by porters. The magnitude of this task is shown by the fact that the maximum weight carried by a single man on his shoulder is thirty pounds. M. Janssen, however, having built a house on Grand Mulets and another on Rocher Rouges, a great part of the work can be executed in stages. Quite half the structure will be fixed in frozen snow. It is intended to erect a cupola on the summit of the observatory for astronomical observation, and to communicate with Chamounix by means of semaphorical signals when the atmosphere is sufficiently clear. Owing to the immense cost of transport to the summit, the cupola will be of aluminium instead of copper, the metal generally employed in such cases. A small house placed temporarily for testing the true degree of resistance of the snow has proved quite satisfactory, and it is hoped that the observatory will be in position on Mont Blanc at the beginning of October, 1893.

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THE ECONOMIC PRODUCTS OF BRITISH NEW GUINEA.—Baron Ferdinand Von Mueller in a recent paper calls attention to the economic possibilities of British New Guinea opened up by the explorations and administrative travels of Sir William Macgregor. In this new territorial possession we have several sources of wealth. Some of the grasses indigenous to New Guinea, such as the *Panicums*, possess very tender foliage and are of distinct nutritive value. New sources for fibre are afforded by the many Urticaceous trees and shrubs indigenous to the Possession, while there are numerous species of the *Sapotaceæ* and of *Ficus* which might yield respectively gutta-percha and caoutchouc. New resin plants, superior ebony-wood, and possibly grape-vines of cultural value must be added to this list.

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THE PHYLLOXERA IN FRANCE.—Agriculturists in France are complaining of the ravages of the phylloxera. In 1875, the year preceding its appearance, the vineyards of France produced nearly two thousand millions of gallons of wine, while last year they produced only one-third of that amount. This pest has caused a complete revolution in the imports and exports of wine. Before its appearance, France exported about eighty million gallons and imported only six million gallons. Last year, her imports for the first eleven months amounted to two hundred and four million gallons, and her exports for the same period of time fell short of thirty-nine million gallons. The French Chambers having placed a high duty on dried currants and raisins imported from abroad, the quantity of wine made in France from this source has dropped to little more than a third of what it was two years ago. On the other hand, the cider crop is increasing yearly.

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FOREIGN PRIZES FOR SCIENCE.—The Royal Academy of Sciences of Turin offers for international competition the Bressa prize of 10,416 francs to the scientific author or inventor who before the end of 1894 shall "have made the most important and useful discovery, or published the most useful work on physical and experimental science, natural history, mathematics, chemistry, physiology and pathology, as well as geology, history, geography and statistics." Competitors must send their work or description of discovery, which must be printed, to M. Lessona, the President of the Academy. Several scientific prizes, open to competitors of any nation, will be awarded at the next public meeting of the French Academy in December, 1893. The *Prix Lalande* of 540 francs and the *Prix Valz* of 460 francs, are for the most interesting observation or the memoir most useful for the progress of astronomy; and the three La Caze prizes of 10,000 francs each for the best contributions to the sciences of physiology, physics, and chemistry respectively. The *Prix Tchihatchef*, an annual prize of 3,000 francs, is offered to naturalists who have distinguished themselves most in the exploration of the continent of Asia or the adjacent isles, excluding such well-known regions as British India, Asia Minor, Siberia, and Syria. Works for competition must be sent in to the *Secrétariat* before the first of June, 1893.

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SOME ECONOMICAL PURPOSES OF BACTERIA.—It would now seem possible to raise the quality of tobacco and wines by the judicious transplanting of bacteria. Nathan, in the course of some interesting experiments, has shown that the addition of a small proportion of nitrogenous material to the must of fruit results in the formation of more alcohol than usual, while a finer wine-like flavour is thus obtained. Thus, in the case of apple must, when 0·15 gram. ammonium chloride was added with five cubic centimetres per litre to the must, it yielded two per cent. more alcohol, and the cider had a finer and more wine-like flavour than that left untreated

or to which only an additional supply of ammonium chloride was added without the yeast. Kosutany has gone farther in this direction, his experiments on wine yeasts showing that the use of different varieties results in the yield of different percentages of alcohol, while the taste, odour, and bouquet of the wines produced are quite distinct. Still more definite results have been detailed by Suchsland in an important paper lately read before the German Botanical Society. During a long course of investigations on the bacteria found in different kinds of tobacco obtained from all available sources, he has discovered that large numbers of micro-organisms exist in fermented tobacco, and that the inoculation of one kind of the leaf with pure cultures of bacteria obtained from another kind results in the development of the taste and aroma peculiar to the latter in the variety operated upon. In this connection it may be well to note that at King's College a special course on 'The Bacteriology of Fermentation' is commencing, which is designed to meet the requirements of brewers, analysts, etc. The lectures have for their subject micro-organisms generally, the *Saccharomycetes* and *Torulæ*, so-called unorganised and organised ferments, high and low fermentation processes, and the diseases of beer and yeast. Microscopes and reagents are provided, and the practical work covers types of organisms, typical yeasts, ascopores, etc. This is the first course of the kind that has been open to the public.

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THE MODE OF PRODUCTION OF PERFUME IN FLOWERS.—In an interesting paper contributed to the *Comptes Rendus de l'Academie des Sciences*, M. Mesnard details the manner in which the perfume of flowers is produced. His conclusions are briefly these: the essential oil is generally found localised in the epidermal cells of the upper surface of the petals and sepals (*e.g.*, in the jasmine, rose and violet). It may exist upon both surfaces, especially if the floral organs are wholly hidden in the bud. The lower surface of the sepals and petals generally contains tannin or pigments derived from it. In every case the chlorophyll seems to give rise to the essential oil. Being thus diverted from its original purpose, it may be transformed into permanent compounds of tannin or into essential oils. Two facts are accountable for the odourless properties of flowers with green petals, for the characteristically disagreeable odour of the *Compositæ*, which are rich in tannin, and for the odoriferous properties of roses and white flowers. It is only when the essential oil is sufficiently freed from the intermediate compounds which have given rise to it that the liberation of perfume in the flower becomes perceptible, and its formation is to some extent in inverse proportion to that of the tannin and pigments in the flower.

J. R. G.

—o—

OUR PUPIL TEACHERS' COURSE.

I. THE GOVERNMENT BY VERBS.

1. This is a subject which always presents considerable difficulty to the Junior Pupil Teacher, and in which even many Scholarship Candidates show themselves to be incompletely grounded.

It is, moreover, complicated by the unnecessary confusion arising from the triple use of the word '*governing*' as applied to a verb, a preposition and a possessive case.

Much would be gained if grammarians would restrict *government* to verbs, and say that prepositions *dominate*, and possessive cases *qualify*.

Government by a preposition is altogether a different function from *government* by a verb.

2. To thoroughly understand verbal government, entirely clear notions of the difference between transitive and intransitive verbs, between the active and passive voice, and of copulative verbs must be acquired.

As a rule (the principal exceptions to which will be duly noted) intransitive verbs cannot govern. Also, speaking generally, transitive verbs in the passive voice cannot govern. It must be remembered that intransitive verbs cannot have 'voice.' Copulative verbs are merely connectives, and even when objective cases follow them, these are not governed by the copulative verbs.

The general rule, therefore, is '*only transitive verbs in the active voice govern.*'

3. Every active verb must have at least one object expressed or understood, *e.g.*, '*Samuel wrote the book*,' '*I informed* ∧'

Many verbs have, however, more than one object, and these may be (1) of the same kind as '*Samuel wrote the* BOOK *and the* LETTER' (this is, strictly speaking, only *one* object), or, (2) of different kinds, as '*I told* HIM *the* STORY,' '*We taught* JOHN NAVIGATION,' '*I bought* HER *a* BONNET.'

Another species of double object (and government), viz., the factitive coming after verbs of making, deserves attention, *e.g.*, '*The people crowned him* KING.' Here *king* is factitive object. [*Factitive* is derived from L. *facio* = I make.]

4. From certain verbs which can take two objects arises a curious exception to the general rule that '*Passive verbs cannot govern.*' For when these verbs are converted into the passive voice, only one of the objective cases (previously used in the active voice) can be translated into the nominative. Thus, taking our previous illustration, we can convert

'*We taught John navigation*' (active voice) into

(*a*) '*Navigation was taught John by us*' (passive voice); OR,

(*b*) '*John was taught navigation by us*' (passive voice).

But we cannot say '*John and navigation were taught by us.*'

In such instances, therefore, one of the original objects of the active voice is retained even after conversion into the passive voice, and is accordingly appropriately termed the '*retained object.*'

5. The principal exception to the general rule that '*intransitive verbs cannot govern*' is in the instance of the cognate object.

When the root meaning of the object is akin to the root meaning of the verb, the two are said to be *cognate*, viz., born together, of common origin. Good instances are—

'*They have* SLEPT *their* SLEEP.'

'*John* RAN *a* RACE.'

A rather more difficult one is—

'*The gutters* RAN BLOOD.'

Which may be generically rendered—

'*The gutters* FLOWED *a* FLUID.'

6. Verbs taking cognate objects are a link between transitive and intransitive verbs, and sometimes it is extremely difficult to decide whether a verb is intransitive governing a cognate object, or transitive governing an ordinary object, *e.g.*—

'He sighed a sigh.'

'He heaved a sigh.'

'He spake a speech.'

'He spake the word,' etc.

7. Transitive verbs like *must* and *can* which cannot directly govern a noun without the intervention of an infinitive are called indeterminate verbs. We cannot say '*I must a ship.*' It is too indefinite. But '*I must buy a ship*,' is all right. Here *to buy* is a prolative (or carrying forward) verb because it transmits the governing power of *must* to the noun *ship*. Owing to the non-comprehension of this class of verbs, *must* and *can* are sometimes classed as auxiliaries, and an absurd mood '*The Potential*' is invented.

In Shakespeare when the infinitive prolative verb can be gathered from the context, it is omitted, as—

'*I must* ∧ *to Coventry.*'

In this example the idea of *motion to* is expressed by the preposition '*to.*'

8. Care must be taken not to mistake adverbial objects for verbal ones, *e.g.*:—

'*It weighed a* POUND.'

'*He measured six* FEET *in his stockings.*'

II. MODEL ANSWERS TO HISTORY QUESTIONS (*October, 1892*).

First Year.

1. Give some account of (*a*) the Picts, and (*b*) the Scots.

(*a*) The Picts were the ancient inhabitants of Scotland. It is a matter of controversy whether they were a Celtic or Teutonic people, although the preponderance of opinion inclines to the former belief.

They are first mentioned by Eumenius in the year 296 A.D.; next we are told that S. Ninian preached to them in the fifth century, and that S. Columba converted them to Christianity in the sixth century. They were never thoroughly subdued by the Romans, and to repel their southern incursions the great walls of Agricola and Hadrian were constructed.

When Britain was evacuated by the Romans, 410 A.D., they wrought fearful havoc in England until the advent of the Saxons.

In the middle of the ninth century the Picts and Scots amalgamated under one king.

(*b*) The Scots were a Celtic race which, migrating from Ireland about the third century, occupied Argyle, and finally all lowland

Scotland. They must not be confounded with the Saxons who subsequently conquered the country south of the Highlands. Embracing Christianity much earlier than the Picts, they fused into one nationality with great facility, owing to their kindred speech and race.

2. Say roughly what were the boundaries of any three of the kingdoms that arose in England during the first eight centuries of the Christian Era.

(*a*) *Kent* comprised the modern county of that name.

(*b*) *Sussex* occupied the counties of Sussex, Surrey, and N.W. Kent.

(*c*) *Wessex* extended south of the Thames from Sussex to Devon.

(*d*) *Essex* stretched over the counties of Essex, Hertford, and S.E. Bedford.

(*e*) *East Anglia* included Norfolk, Suffolk, Cambridge, and part of Huntingdon.

(*f*) *Northumbria* embraced all the country west of the Pennines, from the Forth to the Humber.

(*g*) *Mercia* lay between Northumbria and modern Lancashire on the N., East Anglia on the E., the Thames on the S., and Wales on the W.

[N.B.—Our readers are requested to note the avoidance of repetition of the same verb, and the use of *comprised, occupied, extended, stretched, included, embraced, lay*, in its stead.]

3. Describe any of the different ranks or classes of men which are mentioned in Early English History.

(*a*) The *king* had the following prerogatives:—Summoning and proroguing the Witan, appointing Aldermen and other public officers, superintending the coinage, the right of purveyance, rights of property in forests, treasure-trove, mines, wrecks, tolls, markets, etc.

(*b*) Next in order were the *alderman or earls*. The alderman led the men to battle, presided with the Bishops at the County-mote, and enforced the execution of justice. Of all fines, etc., paid to the king within his jurisdiction, he received one-third.

(*c*) The *thanes* were a numerous and distinguished class. They held their lands by tenure of service about their lord or in the field.

(*d*) The *ceorl* was a freeman who could be called upon to bear arms for the public defence. He was protected against violence to himself or trespass on his land. A ceorl became a thane through (1) book-learning, (2) making three voyages to a foreign country with his own cargo, or (3) owning five hides of land.

(*e*) The *theows, thralls, or serfs*, were at the bottom of the social ladder. They were comprised of the descendants of the aboriginal and enslaved British, captives in war, and criminals. They were generally attached to the land and were sold with it, though the most degraded could pass from hand to hand like cattle or money.

4. In what parts of the country, and under what leaders, do we hear of the British making most resistance to their enemies?

The west of England being most mountainous and furthest removed from the Saxons' points of access, was stubbornly and for a long period successfully held by the Britons. The kingdoms of Strathclyde and Cumbria, Cambria, and West Wales (Devon and Cornwall), long maintained their independence under such leaders as Arthur, Cadwallon, Rhodi Mawr, and Howel.

5. Sketch briefly the period of the Danish rule in England.

The Danish supremacy lasted from 1016 to 1042 under Canute, Harold Harefoot, and Hardicanute. Canute, dismissing most of his Danish troops, ruled England wisely and well, and by the help of his new subjects conquered Norway and Sweden, and became Feudal Superior of Scotland. During his declining years he made a pilgrimage to Rome.

Harold Harefoot (1035 to 1040) was at first sovereign of the country north of the Thames, whilst Godwin governed Wessex for Hardicanute. However, on the assassination of Alfred, son of Ethelred II., all England submitted to Harefoot's sway.

Hardicanute (1040 to 1042) ruled all England with at first universal acquiescene, but his ferocity and avarice soon heavily oppressed the land. He died of drunkenness at a marriage feast.

During this period there was a considerable fusion of Danes and Saxons.

6. What were the circumstances that contributed to the success of William of Normandy in his invasion?

(*a*) The disintegrated state of the kingdom owing to the large earldoms.

(*b*) The accession of the Godwin family and consequent jealousy of Edwin and Morcar, etc.

(*c*) The rule of the Danes only twenty-four years previously.

(*d*) The non-existence of a standing army and fleet.

(*e*) The comparative absence of patriotism and ability among the Saxon chiefs.

(*f*) The hostility of the Romish Church to Harold.

(*g*) The non-existence of strongholds.

(*h*) The presence of a large number of serfs, and

(*i*) The revolt of Tostig and invasion of Hardrada.

Second Year.—

1. (*a*) What English princes took part in crusades, and (*b*) what good or harm may Western Europe be considered to have derived from these wars?

(*a*) Robert of Normandy took part in the Second Crusade 1096, Richard I. in the Third Crusade, 1190, and Prince Edward (Edward I.) in the Eighth and last Crusade, 1272.

(*b*) The crusades communicated a strong impulse to minds and manners. They favoured the progress of freedom by incidentally enfranchising many serfs, and by greatly stimulating commerce. The comforts of the East were introduced, merchants obtained great consideration, and maritime intercourse greatly developed.

To the crusades we owe cane-sugar, saffron, indigo, the art of weaving silk, improvements in dyeing, great progress in navigation, history, geography, politeness, and some enfranchisment of body, mind, and spirit.

2. Give an outline of the reign of Richard II.

Richard II. ascended the throne (1377) on the death of his grandfather, Edward III. Being only eleven years of age, the chief power during his minority was in the hands of his uncles, the Dukes of Gloucester and Lancaster. Early in the reign (1381) there was a formidable insurrection of the villeins, headed by Wat Tyler, which captured London, and was only quelled by insincere concessions.

In 1388 occurred the defeat of the English by the Scotch at Otterbourne.

The most important event of the reign was the Statute of Praemunire (1392), aimed against Papal encroachments.

When in his twenty-third year, the king assumed the government and ruled arbitrarily, yet feebly, for ten years.

The famous John of Gaunt dying in 1399, Richard seized the Lancastrian estates. This brought back the banished Hereford, the new Duke of Lancaster, who, finding his cousin thoroughly unpopular, seized the crown. Richard was murdered the following year in Pontefract Castle.

3. What do you consider the three most noteworthy English events of the Fourteenth Century, and why?

(*a*) *The Battle of Bannockburn* (1314) practically secured the independence of Scotland, and thereby paved the way for a subsequent and lasting union on equal terms. No fusion by conquest was ever possible.

(*b*) *The recognition of English as the national language* greatly promoted the amalgamation of the different races, stimulated the growth of that indigenous literature which was to attain such a splendid pre-eminence, and materially aided the administration of justice between man and man.

This measure far outshines the useless glory of Crecy.

(*c*) *Wycliffe's translation of the Vulgate* (1380), the first rendering into the vernacular, was of immense importance in (1) assisting to settle English forms of speech, (2) repelling the excessive claims of sacerdotalism, (3) implanting a disposition for inquiry, (4) animating the spirit of freedom, and (5) in clearing the road for religious, political, and social reform.

4. (*a*) What do you know of the composition of the Parliaments prior to the reign of Edward I.?

(*b*) Where were they held?

England has never been without a National Assembly. Even after the Conquest the Witan continued to be summoned, but it insensibly changed into the court of the king's feudal vassals.

The great links between the Witan and the feudal Great Council are to be found in the famous Gemot of Salisbury, 1086, and the similar gathering at the same city in 1116.

After this, the ancient National Assembly ceased to be anything more than an assembly of the greater barons and clergy, and it ultimately developed into a hereditary House of Lords. The king had, however, always the right of summoning other persons who held nothing from the crown.

The first instance of *representation* is afforded by the council held at St. Albans, 1213, which was attended not only by the bishops

and barons, but also by the representative reeve and four men from each township on the royal demesne.

Before De Montfort's celebrated Parliament of 1265, there occurred seven other instances of representatives from the shires, viz, to—

The Parliament at Oxford 1213; the sectional Parliaments of 1220 and 1225; the partial Parliament at Lincoln, 1226; the Parliament at Westminster, 1254; the Parliament at St. Albans, 1261, and at London, 1264.

To the Parliament of 1265, at London, representatives from the boroughs were also summoned.

It should be noted that the clergy formed a separate estate, voting their own subsidies.

(*c*) The Parliaments, as may be gathered from the foregoing, were summoned at any suitable places, chiefly to suit the king's convenience.

5. Sketch the gradual decline of the English power in France after the death of Henry V.

The decline commenced with the advent of Joan of Arc who relieved Orleans in 1429, defeated the English at Jargeau and Patay, and procured the crowning of Charles VII. at Rheims. In 1431 the French captured Harfleur, and four years later Burgundy formally abandoned the English Alliance and assisted in expelling the English from Paris.

The quarrels of Gloucester and Beaufort (1437-1445) further weakened the English, who sometimes met with success, but mostly with loss, and in the latter year Henry VI., on his marriage with Margaret, surrendered Anjou and Maine. These being the keys of Normandy, that province was soon overrun. Gascony submitted in 1451, and when Talbot fell in 1453, Bordeaux was taken, and the English retained Calais only.

6. What sovereigns have been famous for their administration of justice, and what laws or institutions are connected with their names?

(*a*) Alfred (871-901) executed as many as forty corrupt judges in one year, and though he did not originate many of the institutions ascribed to him, he consolidated those already in existence.

(*b*) Henry II. (1154-1189) personally dispensed justice, divided the Kingdom into six circuits, each itinerated by three judges, and abolished compurgation in favour of the Grand Assize, an important step towards trial by jury. His Constitutions of Clarendon (1164) rendered the clergy more amenable to the ordinary law.

(*c*) Edward I. (1272-1307) legislated so fully that the distributive justice of England for the next 400 years may be said to have been settled and established by him. He established a parliamentary government on a permanent footing, defined the limits of the three courts of justice, improved the regulations for the preservation of public order, and rolled back the tide of papal aggression.

The principal statutes of his reign are those of Westminster (1275), Mortmain (1279), Merchants (1283), Westminster (1285), and Quia Emptores (1290).

(*d*) Edward III.'s reign is noted for the statutes of Treasons (1352), and Praemunire (1353).

Third Year.—

1. What opposition did Henry VII. meet with during his reign, and how was it overcome?

(*a*) The first rising was in 1486 under Lord Lovel, but the Duke of Bedford easily dispersed the insurgents in Dublin.

(*b*) In 1487 Lambert Simnel, falsely representing himself to be Edward Earl of Warwick, was crowned as Edward VI., and was assisted by 2,000 veterans furnished by the Duchess of Burgundy. Landing at Furness, and marching southwards through Yorkshire, the rebels were decisively defeated at Stoke, near Newark. Simnel was placed in the royal kitchen.

(*c*) Perkin Warbeck, pretending to be Richard Duke of York, made descents upon Cork, Deal, Waterford, captured St. Michael's Mount, and pushed forward to Taunton. Here he lost courage and took sanctuary at Beaulieu, whilst the revolt was easily crushed. In 1499 he was hanged and quartered.

Warbeck was supported by the Irish, the Burgundians, and the Scotch. James IV. invaded the northern counties in his company (1496), and gave him Lady Catherine Gordon in marriage.

(*d*) In 1497 Lord Audley headed 16,000 Cornishmen who marched on London, but were defeated and scattered at Deptford Bridge.

2. How was the dissolution of the monasteries accomplished? Give particulars of any resistance that took place.

The dissolution of the religious houses commenced in 1535. Their visitation was committed to Thomas Cranmer. In 1535 and 1536 three hundred and seventy-six of the smaller houses, whose income did not exceed £200 per annum, were abolished.

Great disaffection soon resulted. There was an insurrection in Lincolnshire, and in the north a very formidable rising, sanctioned by many clergy and nobles, took place. York and Hull surrendered, but an amnesty, procured by the Duke of Norfolk, stayed their progress at Doncaster. This movement was called '*The Pilgrimage of Grace*.'

The following year it broke out anew, but was suppressed by force, many persons of distinction being subsequently executed.

These disturbances furnished an excuse for the suppression of the larger monasteries, which took place, to the number of 500, in 1539 and 1540.

3. Give a short life of Shakespeare, OR of Milton.

William Shakespeare, the world's greatest dramatist, was born at Stratford-on-Avon in 1564. Very little is known of his career. During his youth he was somewhat unsteady. In his eighteenth year he married Ann Hathaway, and shortly afterwards took up the part of an actor at the Globe theatre in London. To this rôle he added that of dramatist and part proprietor of the Globe and Blackfriars theatres. His great ambition was to attain a competency such as would enable him to settle down as a country gentleman. In pursuance of this object he purchased Stratford Place in 1597, and thither retired in 1604. There he died in 1616 at the comparatively early age of 52.

His thirty-seven plays may be arranged in five periods, Comedies 1591-1594, Historical plays 1593-1598, Transitional Dramas 1598-1602. Tragedies 1602-1608, Rustic Plays 1608-1613.

John Milton was born in London in 1608, and educated at St. Paul's School and Cambridge University. Before his 25th year he wrote Comus, Lycidas, and other poems, and in his 30th year visited Italy. The troublous times caused him to appear as a political writer in 1641. Eight years later Cromwell appointed him 'Secretary for foreign tongues.' In 1651 his reply to Dr. Salmatius, 'Defensio pro Populo Anglicano,' was issued, but he became blind the next year. His chief prose works are History of England to the Norman Conquest, Tractate on Education, Areopagitica, and Eikonoklastes.

On the accession of Charles II., he went in hiding for a time, and eventually emerged poor and neglected. Then he wrote his grand poems—Paradise Lost, Paradise Regained, and Samson Agonistes, his daughters acting as amanuenses. In 1674 he died, aged 66, and was buried in St. Giles', Cripplegate.

4. How might (*a*) the greatness and (*b*) the weakness of Elizabeth be illustrated from events in her history?

(*a*) Elizabeth's greatness is evinced by the fortitude she displayed under the vicissitudes of her early life, her patience during her sister's reign, her selection of wise councillors, her heroism at the time of the Armada, her sagacity in assisting the Protestants abroad, her wise encouragement of letters, commerce, and exploration, and by her judicious yielding to constitutional reforms before the national spirit was thoroughly aroused.

(*b*) Elizabeth's weakness is displayed in her behaviour towards such favourites as Essex and Leicester, in her jealousy of Mary Queen of Scots, in her encouragement of matrimonial offers and in her love of dress.

5. Contrast the grievances of the nation under Charles I. and James II.

(*a*) Charles I. claimed to levy money without consent of Parliament, to rule without the existence of a Parliament (1629-1640), to imprison, mutilate and fine arbitrarily by means of the illegal courts of the Star Chamber and High Commission, and to control religious and civil liberty. He set no bounds to the rights and exercise of his prerogative.

(*b*) James II. was chiefly intent upon supplanting Protestantism by means of despotic power. He commenced badly by ordering the customs and excise duties to be levied in his name, and he openly attended the prohibited Mass.

Next he released by proclamation all persons confined for religious offences, and gave the reins to his ferocity on the suppression of Monmouth's rebellion.

In 1685 James established a Standing Army, and began to exercise the Dispensing Power; and in 1686 he re-established the Court of High Commission, and publicly received a papal nuncio at Windsor.

In 1687 he issued the Declaration of Indulgence and attempted to Romanise the universities. The next year brought on the crisis. The Declaration was issued a second time and ordered to be read from the Church pulpits.

PUPIL TEACHERS' ROUTINE FOR FEBRUARY, 1893.

DAYS	YEARS	FIRST WEEK. 1st Lesson	2nd Lesson	3rd Lesson	SECOND WEEK. 1st Lesson	2nd Lesson	3rd Lesson	THIRD WEEK. 1st Lesson	2nd Lesson	3rd Lesson	FOURTH WEEK. 1st Lesson	2nd Lesson	3rd Lesson	French or Latin	Science	Drawing	Music	Mensuration or Sewing
MONDAY	1	Analysis and Parsing of Latin	How to teach Reading	Div. of Decimals. Simple Practice	Analysis and Parsing	How to teach Writing	Map of Chief British Rivers	Analysis and Parsing	How to teach Arithmetic	Physical Geog. of Mountains and Rivers	Composition or Paraphrasing	Lives of Great Men	Geography of England	French or Latin	Science	Drawing	Music	Mensuration or Sewing
	2			Stocks. Reduc. of Vulgar Fractions		Notes of an Arithmetic Lesson	Map of Spanish Peninsula		Notes of a Lesson on Form	Latitude and Longitude			Climates of British Empire					
	3		How to give an Object Lesson	Mens. of Parallelograms. Theory of required rules			Map of Mediterranean Sea			Winds and Ocean Currents			Geography of Africa.					
TUESDAY	1	Euclid I. 9. Knitting Sock	Literature, Repetition, and Writing	Scripture or Revision	Euclid I. 10, 11. Paper Patterns of Garments	Composition or Paraphrasing	Scripture or Revision	Euclid I. 12. Practise Stitches	Instrumental Music or Literature	Scripture or Revision	Euclid I. 13. Practise Stitches	Literature, Repetition, and Writing	Scripture or Revision					
	2	Euclid I. 15, 16. Any Needlework			Euclid I. 17, 18. Flannel Patch			Euc. I. 33, 26 Practise stitches			Euclid Revision. Practise Stitches							
	3	Euclid I. 46, 47. Cross-cut Darns			Euclid I. 47, 48. Any Needlework			Euclid Deductions. Any Needlework			Euclid Deductions. Any Needlework							
WEDNESDAY	1	Dates from 1035 to 1066 A.D.	Div. of Algebra. Practise Stitches	Science	History from Canute to the Confessor	Literature, Repetition, and Writing	Science	History from 1042 to 1066 A.D.	Multiplication of Algebra. Knitting Sock	Science	Anglo-Saxon Literature and Remains	Division of Algebra Any Geography	Science					
	2	History from 1461 to 1483 A.D.	G.C.M. of Algebra Practise Stitches		Dates from 1422 to 1478 A.D.			History from 1478 to 1485 A.D.	Revise Euclid. Knitting Stocking		Revise Literature from 1066 to 1485 A.D.	Division of Algebra Any Geography						
	3	History from 1649 to 1688 A.D.	Problems in Algebra. Any Needlework		Lives of Great Men			Literature from Elizabeth to James II.	Revise Euclid. Cross-cut Darns		Revise Dates	Any Mensuration Any Needlework						
THURSDAY	1	Geography of Ireland	English from Text-book	Div. of Algebra. Stocking-sole Mending	Geography of Ireland	Lives of Great Historic Persons	Euclid Deductions or Domestic Economy	Geography of Ireland	Prefixes, Roots or Affixes	Circulr. Decimals Problems in Vulgar Fractions	Geography of British North America	Euclid Deductions or Domestic Economy	Map of Irish Sea					
	2	Geography of India		Euclid I. 20, 32. Print Patch	Productions of British Empire			Geography of India		Any Vulg. Fractions Miscellaneous Problems	Geography of India		Map of Italy					
	3	Geography of Asia		Revision of Euclid. Hedge-tear Darns	Geography of Asia			Geography of Africa		Miscellaneous Problems	Geography of Asia		Map of South Africa					
FRIDAY	1	Div. of Decimals Easy Multip. of Vulgar Fractions	Test Examination (See appended Questions)		Decimals of Money Simple Proportions	Test Examination (See appended Questions)		Dec. of Weights & Measures. Probs. in Vulgar Fractions	Test Examination (See appended Questions)		Any Decimal Fractions. Misc. Problems	Test Examination (See appended Questions)						
	2	Stocks. Money Decimals			Com. Proportion Reduc. of Decimal Fractions			Com. Proportion. Vulgar Fractions of Weights			Miscellaneous Problems							
	3	Mens. of Parallelograms. Proofs of the required rules			Miscellaneous Problems			Miscellaneous Problems			Geography of Australia							
SATURDAY	1	French or Latin	Science	Drawing	Music	Mensuration or Sewing												
	2																	
	3																	

Seven bishops petitioning against this were committed to the Tower, but being tried before a jury were acquitted. Six months later James fled to France.

6. What do you know of (*a*) The Declaration of Indulgence (*b*) The Declaration of Rights, and (*c*) The Declaration of Breda?

(*a*) *The Declaration of Indulgence* was twice published by James II. (1687, 1688). It declared that the king suspended the execution of all penal laws against religious offences, and forbade the imposition of religious oaths or tests as qualifications for office.

For further detail see previous question.

(*b*) *The Declaration of Rights* was drawn up (1689) by the Convention Parliament and after being passed in due form at the end of the year became '*The Bill of Rights*.' It enacted that the Suspending and Dispensing powers; the Court of High Commission, and all similar bodies; levying money without grant of Parliament; commitments for petitioning; raising a standing army without consent of Parliament; excessive bail, fines and punishments; and grants of fines and forfeitures before conviction were illegal.

It further declared that Protestants could carry arms; election of members of Parliament should be free; speech in Parliament should be free; juries should not be packed, and that Parliaments ought to be held frequently.

(*c*) *The Declaration of Breda* (dated from Breda, 1660) was really the royal charter, on the faith of which Charles II. was allowed to ascend the throne. Its principal clauses provided that a general pardon should be granted, with a few exceptions to be determined by Parliament; no man should be disquieted for differences of opinion in purely religious matter; all disputes concerning grants, sales, purchases of estates should be settled by Parliament; royal consent would be given to acts of Parliament for the aforesaid purposes; and that Monk's army should be duly received into the king's service.

FIRST YEAR.

1. A boy after losing first $\frac{2}{3}$ and afterwards $\frac{1}{4}$ of his original stock of marbles, found that he had 22 left. How many had he at first? Ans. 45.

2. If 105 persons save on an average 19s. 10½d. each in a year, what will their whole savings amount to in 17 years 219 days?
Ans. £1,836 9s.

3. (*Boys only.*) Divide 7·32375 by 105 by means of factors.
Ans. ·06975.

(*Girls only.*) Find by Practice the cost of 3 qrs. 16 lb at £17 10s. per ton. Ans. 15s. 7½d.

4. Write in *Large hand* the words *Alphabetically*, *Methodist*, *Victoria Nyanza*.

Write in *Small hand* 'Twilight and Evening Star,
And one clear call for me.'

5. Analyse the appended passage and parse the italicised words:—

'*To seek* thee did I *often rove*
Through woods *and* on the *green*;
And *thou* wert still a hope, a *love*,
Still longed-for, never *seen*.'—*Wordsworth*.

6. Write down affixes expresses *diminutiveness*, *frequency* or *repetition*, *occupation*, and direction.

7. Describe the interior of your schoolroom.

8. Draw a physical map of England.

9. What do you know of glaciers and icebergs?

10. Describe the great Canadian Lakes.

11. What traces of the Roman occupation of Britain are still extant?

12. Give the dates of Battle of Deorham, Landing of S. Augustine, Death of Penda, Battle of Ockley, Treaty of Wedmore, and Accession of Athelstan.

13. What are the advantages and disadvantages of simultaneous Reading?

14. Write down the Cardinal numbers from 1 to 20 and the Ordinals from 1st to 20th in Latin *or* French.

15. What are the intervals between each pair of consecutive notes in the Major Scale? What are meant by the Upper and Lower Tetrachords?

SECOND YEAR.

1. If a population of 38,755,335 consume on an average 40 lb. of sugar each in a year of 365 days, find in tons cwts. and lbs. their total average daily consumption. Ans. 1896 tons 1 cwt. 8 lb.

2. A game licence costs £3, and a cartridge 1½d. A sportsman kills a bird once in every three shots. If birds are worth 4s. 6d. a brace, how many birds must be shot just to pay expenses?
Ans. 32.

3. (*Boys only.*) Find the compound interest on £2,756 for two years at 4 per cent. per annum *to the nearest penny*.
Ans. £224 17s. 9d.

(*Girls only.*)

$$\frac{\frac{1}{2}+\frac{1}{3}}{\frac{1}{2}-\frac{1}{3}} - \frac{\frac{1}{2}-\frac{1}{3}}{\frac{1}{2}+\frac{1}{3}} \div \frac{\frac{1}{2}+\frac{1}{3}}{\frac{1}{2}-\frac{1}{3}} + \frac{\frac{1}{2}-\frac{1}{3}}{\frac{1}{2}+\frac{1}{3}} \quad \text{Ans. } 1.$$

4. As in First Year.

5. Analyse the following lines and parse the italicised words:—

'*As* the *flight* of a river *that* flows to the sea,
My soul *rushes ever* in tumult to thee.
A twofold *existence*, I *am where* thou art,
My *heart* in the distance, beats *close* to thy heart.'
—*Lord Lytton*.

6. Paraphrase the above lines.

7. Give the different forms assumed by the prefixes *ad-*, *con-*, *dis-*, *in-*.

8. Draw the coastline from Calais to Venice, marking in capes, ports, bays, river-mouths and character of the seaboard.

9. Compare the climate of Fiji with that of Ceylon.

10. Where and what are Cawnpore, Bornholm, Eubœa, Ghilgit, Basques, and the Pillars of Hercules?

11. What was the policy of the early Norman kings towards their baronage?

12. Give an account of Domesday Book and the Norman system of land tenure.

13. Write out Euclid I. 14.

If two right-angled triangles have their hypothenuses equal, and also one side equal to one side, prove that the angles opposite to the equal sides are equal.

Give recipes for a rice pudding and barley-water.

14. What nouns of Latin first and fifth declensions are masculine, and what nouns of the second and fourth declensions are feminine?

What is the French for *99 men*, *the 300th page*, *the 1001 nights*? From what adjectives are *incessamment*, *follement*, *crûment*, *dûment*, *expressément* formed?

15. Write down alternative forms of the following manuscript capitals:—B, E, G, J, K, M, N, R, V, W, Y, Z, stating which you prefer and why?

16. What are the signatures of E♭, F♯, F and E major?

Re-write the following in the '*better method*':—

d n s fe s l s d' d' ta l l t t d.

THIRD YEAR.

1. Show that division by $\frac{2}{3}$ is equal to multiplication by $\frac{3}{2}$; and that division by $\frac{3}{4}$ is equal to multiplication by $\frac{4}{3}$. Take the examples 12s. $\div \frac{2}{3} =$ 12s. $\times \frac{3}{2}$; and 15s. $\div \frac{3}{4} =$ 15s. $\times \frac{4}{3}$.

2. If 5 men and 9 boys could do a piece of work in 17 days which 9 men and 12 boys could do in 11 days, in how many days could 3 men and 5 boys do it? Ans. 29⅛ days.

3. (*Boys only.*) By selling a piece of land for £363 4s. a man gained 13⅓ per cent. How much would he have gained or lost per cent. by selling it for £276 16s.? Ans. 13⅓ per cent. loss.

(*Girls only.*) Find the value of ·86⅔ of £21 18s. 7½d. *minus* 3·05 of £1 1s. 8d. *minus* 5·375 of £2 9s. 4d. Ans. £2 7s. 6⅔d.

4. As in First Year.

5. Paraphrase:—

'Lives of great men *all* remind us
We *can make* our lives *sublime*,
And *departing*, leave *behind* us
Footprints on the sands of time;
Footprints, *that perhaps another*,
Sailing o'er Life's solemn main,
A forlorn, a shipwrecked *brother*,
Seeing, shall take *heart again*.'—*Longfellow*.

6. Analyse the above lines and parse the words in italics.

7. Select the prefixes from the following words, and give their meaning with another example:—

Ambidexterous, *Aphelion*, *Catholic*, *Epicycle*, *Prototype*, and *Symmetry*.

8. Draw a map of British South Africa.

9. Describe the deserts of Asia.

10. Explain the effects of prevailing winds upon the climate of India.

11. Who were Margaret of Burgundy, Charles Brandon, Ann of Cleves, Ket the Tanner, and John Knox?

12. Give the dates of Battle of Langside, Treaty of Cateau Cambresis, Massacre of St. Bartholomew, Settlement of Virginia, and Colonisation of Ulster.

13. Write out Euclid I. 32, together with its two principal corollaries.

Enumerate twelve common-sense rules for the preservation of health.

14. Give in full the active indicative perfect of *prodo*, and the active pluperfect subjunctive of *nolo*.

Write out in full the negative subjunctive present of *tenir*; and state the present and past participles of *dire*, *pleuvoir*, *voir*, adding the feminine form when it exists.

15. How would you explain to Standard V., *Voice* in verbs?

What *forms* would you explain to children in the second class of a good Infants' School?

16. Write out three forms of the Minor Scale.

How would you introduce *ba* into modulator exercises?

17. Prove the rule for the multiplication of algebraic fractions.

What would be the cost of an outfit for a parlourmaid going to service and leaving her old clothing for her younger sisters?

18. The side of an equilateral triangle is 2 feet 6 inches; find its altitude. Ans. 25·98 inches.

(*For Correspondence see end of Certificate Article.*)

—o—

NEW COMPOSITION STORIES.—STANDARD V.

Suitable for 'Unseen Tests' in Reading also.

No. 256.

DANDIE AND THE BAD PENNY.—Dandie was a handsome Newfoundland dog that belonged to a gentleman in Edinburgh. His master's friends, when they met him, would often give him a penny, and he would trot off to the baker's with it, and buy biscuits for himself. One day Dandie met one of these gentlemen, wagged his tail, and looked up into his face, asking for a penny. The gentleman felt in his pockets, and then said, 'I haven't a penny with me, Dandie, but I have one at home.' Some time after he had reached his house, a noise was heard at the front door. The servant went and opened it, when in rushed Dandie for his penny. The gentleman thought he would play him a trick, and gave him a bad one. Dandie went as usual to the shop; but the baker, finding the money was bad, refused to give him anything for it. Disgusted at this, the dog returned to the house. When he was let in, he ran up to the gentleman who had given him the penny, dropped it at his feet, departed indignantly, with his tail in the air, and never accosted the gentleman again.

No. 257.

OUTWITTED.—A mean old gentleman at one of the seaside resorts on the south coast thought he had secured a good bargain in arranging with a boatman to take him out to the Goodwin Sands, a distance of four miles, for the small sum of three shillings. They went, and when he had landed and was about to explore, he noticed the boatman preparing to row home again without him. 'Hi!' shouted the old gentleman, 'don't leave me behind.' 'All right,' said the boatman; 'but the return fare will be six shillings more.' Expostulations were in vain, so the old gentleman was forced to accept the conditions and pay.

No. 258.

A CUNNING DOG.—A gentleman owns two dogs, one being a large mastiff and the other a small terrier. Both dogs occupy the same kennel, and the mastiff thinking that might is right, always secures the warmest corner. Every night the terrier runs round and begins to bark, as if someone was in the yard. The mastiff comes out to see what is the matter, when the little dog pops into the snug corner. Thus it goes on deceiving the big dog, which never gets any wiser.

No. 259.

HOW THE GENERAL WAS DEFEATED.—During a great uprising of Indians, the attacking general was much amused to see the savages use blankets as a shield against his soldiers' bullets. Holding up a blanket at both ends, so that the edge just touched the ground, the Indians marched boldly towards him behind this apparently flimsy protection. The general was soon alarmed, however, to find that his bullets did not stop the strange advance, and the moving fort of blankets soon came so close to him and poured in such a deadly fire that he was fain to fly the field in confusion and great loss. The Indians had become acquainted with the simple fact that while a bullet will pass through twenty blankets strained over a frame or laid against a firm surface, it will not penetrate a single one if moistened and hung up so as to swing clear of the ground. The bullets which the general imagined were passing through the blankets and thinning the ranks of the savages were thus rendered harmless.

No. 260.

THE DOG AND THE KITTEN.—A gentleman farmer had an affectionate sheep-dog, of which he was very fond; he also had two or three cats. One of these cats had some kittens. As he did not want to keep all of them, the farmer killed and buried all but one, Grip (the dog) watching him meanwhile. As soon as he had finished, Grip ran back and fetched the other kitten in her mouth; then she dug a hole with her paws and buried the poor little thing alive. The mother hearing its cries, came to see what was the matter, and immediately scratched it up again from its uncomfortable bed and took it home. I suppose the dog thought that her master had forgotten to bury that kitten and she would do it for him.

No. 261.

STORY OF A FOX.—A huntsman having purchased a young fox, made arrangements for a day's run with the local harriers. A month of frosty weather, however, put an end to his sporting anticipations. Meantime, the huntsman fed the fox himself, and made his prisoner as comfortable as possible. Reynard soon became the pet of the huntsman's children, and when the frost disappeared it was with less enthusiasm for sport that he set about preparations for the run. When the field assembled, the fox was started, and hounds and hunters followed in hot pursuit. Poor Reynard soon became alive to his danger, and with the wonted 'cuteness of his kind doubled upon his pursuers, and made straight for the horses. Notwithstanding his fright and danger, he singled out his former friend and huntsman with marvellous instinct, and when a moment's hesitation would have been fatal, he leaped upon the saddle, and nestled closely against the red-coated rider. His piteous looks and trustful appeal in his extremity to his friend and protector proved too much for the huntsman. Reynard's life was spared, the hunt abandoned, and, it is satisfactory to add, the reprieved animal became once more the pet of the household.

No. 262.

THE KING AND THE FORTUNE-TELLER.—A king of France, in the olden time, was very angry with his chief fortune-teller for prophesying something disagreeable to his Majesty. He summoned him to the palace, previously giving instructions to the servants that, upon giving a certain signal, the astrologer was to be thrown through the window, and thus killed. When he came, the king said, 'You are able to foretell the fate of others; now tell us what your own will be, and when you will die.' The poor man quickly guessed that mischief was brewing, so, with great presence of mind, he answered: 'I know my own fate, and I shall die just three days before your Majesty.' The king was greatly alarmed, and instead of putting him to death, he ordered every care to be taken of him, so that his own life might be preserved as long as possible.

No. 263.

STORY OF THREE CHILDREN.—Some years ago there were three children, left orphans in Germany, their only remaining relatives living in America. Some Christian people bethought them of a device for transporting these children to their new home in the West. They supplied them with clearly-written instructions in three languages, as to the places through which they must pass, and they also provided them with some money. And then they gave them a large Testament, on the fly-leaf of which they wrote clearly in German, French, and English some words which they were to hold in front of them, trusting that someone would read the inscription, and be both able and willing to help them in their need. The words were, 'Then shall the King say unto them on his right hand: Verily I say unto you, inasmuch as ye did it unto one of the least of these, My brethren, ye did it unto Me.' Those children reached the Far West in safety, and the Great King never failed them once.

No. 264.

AN INGENIOUS DEVICE.—An Englishman who was travelling in the East was anxious to make sure that his horse always had its proper feed of corn, and told his servant to take great care that it was not stolen. The man hit upon the plan of putting seven or eight pebbles into the manger with the oats, and found that they formed a good test. The horse was far too wise to eat them, and if he had all his corn the pebbles were found at the bottom; but if a thief stole any of the oats, he was sure to get some of the stones in it, and if the groom found only four or five he knew what had happened, and threatened the people that his master would take them before the magistrate. They could never understand how he came to know of their dishonesty, looking upon him as a wizard, and his horse's food ceased to be tampered with.

No. 265.

JUSTICE.—When Frederick the Great was building himself a grand palace, there was a mill close by which he wished to buy. To the overtures made to him, the miller replied that he had lived there all his life, and that the mill had belonged to his forefathers for many generations; therefore he would not sell it at any price. Frederick offered to build him another mill in a better place, besides giving him as much money as he liked to ask; but the obstinate miller was still determined to retain the possession of his ancestors. The king, having tried all the means he could think of, was extremely angry at last, and said to the miller—'Why do you refuse to sell your mill, notwithstanding all the advantages I have offered you?' The miller stated his reasons. 'Do you know,' the king said, 'that I could take it from you without giving you a farthing?' 'Yes,' replied the miller, 'but that would not be justice.' The king was so flattered with the miller's reply, that he altered the plan of his gardens, so as to leave out the mill.

No. 266.

WHAT A LITTLE BIRD'S SONG DID.—One day a little boy was playing in a garden, when a small bird alighted on the bough of a tree hard by. Looking about for a moment, the lad, without much thought, took up a stone that lay close at hand, and prepared to throw it. The child's arm was spread out ready, but the bird was not frightened away by the movement. Suddenly from its tiny throat there issued quite a stream of notes of sweetest melody. Little by little the boy's arm was now observed to fall slowly to his side; the stone was dropped silently to the ground; and when the bird had finished its joyous song, it flew away untouched. A gentleman, who had been watching the little boy, at this point came up to him, and said, 'Why didn't you throw at the bird? you might have killed it and taken it home.' With a blush, the boy hung down his head, and it was, we doubt not, with shame that he replied, 'I couldn't, sir—he sung so.'

No. 267.

THE JEWISH MERCHANT AND HIS SLAVE.—A Jewish merchant once journeyed to Rome, taking with him an intelligent slave and all his valuables, and leaving at Jerusalem his only son. But shortly after reaching his destination the merchant died. When the news reached the son, his sorrow was extreme, and it was not lessened by the fact that the deceased had left all his property to the slave, with the exception of any one article that he was at liberty to select. The unfortunate young man went to the Chief Rabbi, and complained of his father's conduct. 'Rather respect him the more,' replied the Rabbi. 'He was fearful that in a strange land the slave would prove unfaithful, and waste your wealth, unless he caused him to preserve it for himself. But do you now proceed to Rome, and choose the slave as the one article left to you.' The son acted as was advised, recovered all his goods, and shortly after set the slave at liberty.

No. 268.

HOW THE MAN WAS RESCUED.—A story is told of a man in Russia, who, while descending into the hollow trunk of a tree to obtain some honey, stuck fast, and was unable to get out. Being too far from home to make his voice heard, he remained in that position two days, sustaining his life by eating the honey. He had given himself up for lost, when, looking up, he saw a large bear above him also in search of honey, and about to descend into the centre of the tree. Bears, when getting into hollows of rocks or trees, go tail-end first, and no sooner did the tail of the bear reach him, than in spite of his dismay, the man caught hold of it. The animal, astonished at finding some big creature below him, quietly scrambled out again, dragging up the man. Once out, the bear hurried off at a quick rate, and the honey-seeker made his way homeward to relate his adventures, and relieve the anxiety of his family.

No. 269.

COMFORTING!—Some time ago a party of gentlemen undertook to penetrate into the depths of a Cornish mine. A professor, who made one of the number, used to relate the following startling incident of the visit. On his ascent in the ordinary manner, by means of a bucket, and with a miner for a fellow-passenger, he perceived, as he thought, certain unmistakable symptoms of fraying in the rope. 'How often do you change your ropes, my good man?' he inquired, when about half-way from the bottom. 'We change them every three months,' replied the man in the bucket, 'and we shall change this one to-morrow, if we get up safely.'

No. 270.

SOLOMON'S JUDGMENT IN CHINESE.—Two women came before a mandarin in China, each of them protesting that she was the mother of a little child they had brought with them. They were so eager and so positive, that the mandarin was sorely puzzled. He retired to consult with his wife, a wise and clever woman, whose opinion was held in great repute in the neighbourhood. She requested five minutes in which to deliberate. At the end of that time she spoke: 'Let the servants catch me a large fish in the river, and let it be brought here alive.' This was done. 'Bring me now the infant,' she said; 'but leave the two women in the outer chamber.' This was done, too. Then the mandarin's wife caused the baby to be undressed, and its clothes to be put on the fish. 'Carry the creature outside now, and throw it into the river in the sight of the two women.' The servant obeyed her orders, flinging the fish into the water, where it rolled about and struggled, disgusted, no doubt, by its wrapping. Without a moment's pause one of the mothers threw herself into the river with a shriek. She must save her drowning child. The mandarin's wife commanded that she should be rescued, and the child given to her. 'Without a doubt she is the true mother,' she declared. And the mandarin nodded his head, and thought his wife the wisest woman in the Flowery kingdom. Meantime, the false mother crept away.

No. 271.

HONESTY REWARDED.—A very poor woman occupied a small room, from which the landlord threatened to drive her as she could not pay the rent. She owed about two pounds. Thinking the good Bishop who lived in the town might help her, she went to him and told her story. The good man was struck with the straightforward manner in which she related her troubles and answered his questions, and, writing a note to his steward, directed her to take it to him. When the steward had read it, he counted out twelve sovereigns, which he handed to the poor woman. But she declined to receive so much, saying that the Bishop must have made a mistake, as she only wanted two pounds. The steward, to clear up the matter, went with the woman to the Bishop, who, reading the letter again, said: 'You are quite right in saying that I have made a mistake, and instead of twelve pounds it should be a hundred.'

No. 272.

THE RAPACIOUS MISER PUNISHED.—A greedy old miser lost a sealed bag containing a hundred pounds in gold. He was in great trouble, and put an advertisement in the paper offering a reward of ten pounds to anyone who restored it. Next day, a poor man who had picked it up brought it to the police-station. Great was the miser's delight when he heard of its being found. Knowing the character of the miser, the chief constable handed the bag to the judge for settlement. When asked what was in the bag, the miser declared that it contained £110—thus trying to cheat the finder out of his reward. The judge examined the bag of gold, and saw that it had never been opened. He then asked the miser, 'How much gold did you say your bag contained?' 'One hundred and ten sovereigns,' was the reply. The bag was opened, the coins counted, and the judge said, 'Well, then, this is not your bag at all, for it has only one hundred.' Turning to the finder, he put the bag and the gold into his hands.

No. 273.

STORY OF A LOST RING.—At Berlin, some years ago, a valuable ring was missing, and though most careful search was made, no trace of it could be found. A big reward was offered, but it was no use. Suspicion fell upon the butler, who was dismissed in consequence. The other servants were likewise discharged, but still the fate of the missing ring remained unsolved. The valuable jewel was recently found in a marvellous manner. Some days ago, the gardener was trimming some trees in the grounds, and discovered the missing trinket lying on a bough, where it had braved the rain, snow, wind, and hail all these years. It is supposed that the ring had been left on the breakfast-table, and that the servant, in shaking

the table-cloth out of the window, had unknowingly thrown it away with the crumbs. Moral: Lost rings are sometimes found; lost situations are never.

No. 274.

A WOLF'S AFFECTION.—A lady once had a tame wolf, which seemed to feel almost as much affection for her as a spaniel. She had occasion to leave home for some weeks. The wolf showed the deepest distress after her departure, and at first refused to take food. During the whole time she was absent he remained much dejected. On her return, as soon as the animal heard her footsteps, he bounded into the room in an ecstasy of delight. Springing up, he placed one paw on each of her shoulders, but the next moment he fell backwards and instantly expired from excitement.

No. 275.

FOLLOWING INSTRUCTIONS.—A lady once employed a girl of fifteen to assist her in the housework. One day she wanted a pudding made, and buying some raisins, she explained to the girl how to stone them. On showing her, she picked up a plum, took the stone out, and remarked: 'This is the way you must do.' Thinking the girl understood now how to stone them, the mistress put the plum in her mouth and went away. Her surprise may be imagined when, a few minutes after, the girl came to her, saying, 'I have eaten all I could.' The lady went into the room and found that the girl had eaten all the plums and put the stones into the dish.

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NEW DICTATION TESTS.

Suitable for 'Unseen Tests' in Reading also.

STANDARD IV.

No. 213.

There is a frog which wears a most gorgeous livery of red and blue. Unlike our frogs, however, which feed at night, this one is perfectly fearless, and hops about in daytime, and never hides itself. He has no reason to be afraid, because animals detest the taste of him. An experiment was made with one of these frogs on some ducks and fowls. All declined the dainty morsel with the exception of one duck, which on taking the frog in its bill immediately dropped it and went about shaking its head as if trying to get rid of some nasty taste.

No. 214.

The quantity of food which enables a man to do his daily work without loss of weight is precisely what he requires. He supplies the daily waste—no more, no less. This quantity may vary a little with each individual, but everyone can easily ascertain his own measure of requirement by reducing the quantity of daily food until he finds a balance of force and weight.

No. 215.

An erroneous impression which is felt in the country regarding London is that it is an unhealthy place. The fact is quite the reverse. It is one of the healthiest towns in Great Britain, and is by far the healthiest metropolis in the world. It is certainly true that there are particular districts in it which, from their low, confined situation, are very unhealthy; but these are the exceptions to the rule. Taken as a whole, London, as the bills of mortality and the number of invalids show, is very healthy.

No. 216.

Before the days of telegraphs in India, messages were sent by camels. The form of the messenger camel denotes speed; his broad feet keep him from sinking into the loose sand; while his curious nostrils, which he can open and shut like the valves of a balloon, enable him to keep out the sand when a sandstorm overtakes him and his rider. These express camels will go at a great pace—even up to twelve miles an hour, it is asserted.

No. 217.

There is little danger of eating too much if our food is natural in kind and quality. It is not very easy, for example, to eat too many grapes, apples, and pears. Sugar, salt, spices and luxurious cookery tempt to excess. With men, as with animals, a natural diet is self-limiting, and we are disposed to stop when we have had enough. The more artificial the food, the more liability to overload the stomach, overtax the digestive power, and overweight the forces of life. Simplicity of food is a condition of health.

No. 218.

The man who has nothing to do is the most miserable of beings. No matter how much wealth a man possesses, he can neither be contented nor happy without occupation. We are born to labour, and the world is our vineyard. We can find a field for usefulness almost anywhere. In occupations we forget our cares, our worldly trials, and our sorrows. If we have enough for ourselves, we can labour for the good of others; and such a task is one of the most delightful duties a worthy and good man can possibly engage in.

No. 219.

Frosts that begin before Christmas—especially white frosts—seldom last very long, and though it is not impossible that a day or two's skating may be had then, young ladies and gentlemen who are partial to that amusement have to wait till later before they get any long spell of it. In the meantime, a few days of rigid cold, binding the earth in fetters of iron, are not without their uses.—(H.M.I.'S TEST.)

No. 220.

During a recent flood the velocity of the water was such, that a rider who had galloped off to warn the people was overtaken and drowned. A confused noise preceded it, but no one heeded it. Then it was too late. The rushing water advanced like an unbroken wall. The terrific force tore beams asunder, toppled over strongly-built factories, carried off bodily, houses and their inmates, and swept away locomotives, and, in one place, an express train.

No. 221.

It is curious to contrast the appearance of the streets of the metropolis at an early hour in the morning with their appearance in the middle of the day. At three or four o'clock in the morning there is not a sound to be heard. All is hushed, as if the silence of death reigned throughout. Nor is there anything to attract the eye, except a few cabs stationed here and there in the streets, with the horses and drivers equally dispirited from sheer exhaustion.

No. 222.

Avoiding, as it does, open spaces, and frequenting the long grasses and standing corn, the corncrake is seldom observed. Some persons suppose that great drought has driven it from its usual haunts. But a more likely reason has been suggested for its disappearance. Owing to its habit of lying close to the ground concealed from human gaze, it is asserted that the labourers cannot see it, and so the mowing machines cut up the nests and kill the birds. It winters in Africa, and spends its summer in Great Britain. It seems a pity that some means cannot be devised for warning the birds of the approach of the deadly machines.

No. 223.

A candle has recently been brought out which extinguishes itself after it has burned for an hour. This it does by means of a tiny extinguisher of tin which is fastened in the wax by wires, and which effectually performs its task. It is only necessary to remove this diminutive cover when its work is done, and the candle is again ready to burn another hour.

No. 224.

It is a common experience amongst mountain climbers to find butterflies lying frozen on the snow, and so brittle that they break unless they are very carefully handled. On being taken to a warmer

climate, however, they recover themselves and fly away. Some insects do not suffer from being frozen, even for a lengthened period; but what is known as an open winter, with its alternations of wet, warmth, and cold, is far more fatal to them.

No. 225.

Skins and furs are some of the earliest substitutes for money, and are still used for this purpose among the Indians; their different values, according to the animal from which they have been taken, rendering them very useful as equivalents of coinage. Thus twelve marten skins are worth four beaver skins or two fox skins, and these in their turn are worth the skin of a single black fox. The recognised value of a rifle is fifteen beaver skins.

No. 226.

A most extraordinary guard takes up its quarters inside the Bank of England every evening at seven o'clock, all the year round, remaining there until seven o'clock the next morning. It is an officer's guard, and consists of a drummer, two sergeants, and thirty men, all well armed. Each man receives a shilling from the bank authorities immediately upon his arrival, a sergeant's share being two shillings. The officer is allowed a supper and two or three bottles of wine, and is permitted to invite a friend if he sees fit to do so.

No. 227.

Alligators form the basis of a new industry in the south of the United States, and the catching and killing of them provide employment for a large number of persons. The hides, oil, and even the flesh of the old animals are turned to profitable account. The old are captured by stratagem. Some young ones are seized near the haunts of the adult creatures, and a stout rope is placed across the spot where they are lying. The youngsters are then easily made to cry out; whereupon an old reptile emerges from its pool, but only to find himself imprisoned in the coils of the rope.

No. 228.

A curious incident connected with the Servian Army is the manner in which most of the regiments carry the big drum. It is not, as in most countries, slung in front of the man who plays it, but is placed upon a small two-wheeled car, drawn by a large dog which has been so trained that it keeps its place even through the longest and most tedious of marches. The drummer takes up his position behind the cart, and performs on the instrument as it moves along.

No. 229.

Go forth to the battle of life, my boy,
Go while it is called to-day;
For the years go out and the years come in,
Regardless of those who may lose or win,
Of those who may work or play.
There's a place for you in the ranks, my boy,
And duty, too, assigned.
Step into the front with a cheerful face;
Be quick, or another may take your place,
And you may be left behind.

STANDARDS V.-VII.

No. 194.

Mutual service is a system which is carried to perfection in the Indian villages. No money is used in exchange for services. The barber attends to the carpenter in return for repairs of ploughs and other wooden implements. The washerman washes the clothes of the physician who attends to him in sickness and so forth. The problem of insufficient income is met in the only possible way—by limitation of wants. The Hindoo has no furniture, not even a hand-basin. He washes in the river and the sun dries him. He has neither chairs, nor beds, nor tables. He uses the floor as a complete substitute; or, if he is dainty, he allows himself the luxury of a mat. Except for cooking-pots, and grain and water jars, his house is as bare as 'Mother Hubbard's cupboard.'

No. 195.

Of all the feathered mendicants who come to us for help in hard times there is none more ready to accept our hospitality than the robin. Nor, on the other hand, is there one more sure of welcome. He is as much the bird of Christmas as the very turkey. We meet him on the cards that carry the compliments of the season; we see his effigy on the covers of Christmas annuals. Even on the stage of the pantomime what player more certain of a part than Robin? Perhaps there is no bird quite so easy to depict in colours; certainly none whom we so early learn to recognise. We were introduced to him under the most favourable of circumstances. We loved him first for his kindly offices towards the lost Babes in the Wood.

No. 196.

Very little children should be allowed to sleep as much as possible, and older children should lead as quiet, even, monotonous lives as possible. For this reason a nurse-girl of an amiable temperament is preferred to a nervous and more energetic person. Such a girl will easily learn to follow the routine necessary in the care of little children. She will not hurry and bustle about, and there is no need of this. Children should not be hurried. When a child is old enough to go to school, it is time enough for it to learn that time is valuable. While it is little, let it develop slowly and naturally, expanding its life as deliberately as the rose or lily unfolds its buds.

No. 197.

The Vice-President of the Institution of Civil Engineers presided a short time since over a meeting held in the room at the base of the South Tower of the Crystal Palace, when the list of certificates awarded by the examiners of the School of Practical Engineering was publicly announced. The Chairman, addressing the students, said: 'They had far greater opportunities and far greater facilities for learning their profession than those which existed in his boyhood. There were then no such schools as that, and no such teachers as those who instructed them. The first engineering works of importance in Great Britain were the canals. They were very useful, no doubt, but they were very insignificant as compared with what modern engineering had done.'

No. 198.

In the course of an address to the students of the Crystal Palace School of Practical Engineering the Chairman said: 'They had now to go into the world with only an introduction to the knowledge which they required. Schools could not make clever men. They could only put into their minds a certain amount of knowledge, which they could use and multiply if they thought proper. Some of them would, no doubt, have to take their talent abroad, and they must never forget that they must be men of expedients, as nature presented many obstacles which could not be got over by rules.' In conclusion, he urged 'them to remember that, wherever they went, they would carry the reputation of their country with them, and that they should so order their lives as to be a credit to themselves, to their teachers, and to the religion which they professed.'

No. 199.

The business man should be industrious and pushing. He must be energetic, enterprising, prompt, and plucky, and at the same time shrewd and discreet. His integrity should be undoubted. He should be a good judge of character to be able to select those he employs and deals with, and have sufficient foresight to be able with confidence to gauge the mind and demands of the public, and to know whether this or that will take, and if the demand will be permanent or temporary. He should believe in himself, and be able to make others believe in him.

No. 200.

The German authorities have long suspected the existence of an organised band of depredators, and have now succeeded in discovering their haunt. On arriving at the entrance of the cave, where they had located themselves, the police arrested two young men. One of the officers boldly ventured into the place and fired off his revolver, which so frightened the inmates that they at once surrendered. The subterranean hall was very roomy and tastefully decorated. All the necessaries for a comfortable existence were there—mattresses, bed-clothing, tables, chairs, food, wine, and several casks of beer. Up to the present, the police have captured five of the cave dwellers, whose ages vary from eighteen to twenty years.

No. 201.

The Bank of France has a considerable degree of nervousness with regard to the capacity of the burglar, and, we are informed, guards its safe in a very careful way. For instance, every day when the money is placed in the vaults in the cellar, a lot of masons are on hand and wall up the doors with hydraulic mortar. Water is then turned on, and kept running until the cellar is flooded. Thus a burglar would have to provide himself with a diving suit and break down a cement wall before he could begin work on the vaults. When the officers arrive in the morning, the water is drawn off, the masonry broken down, and the vaults opened. It is difficult to imagine how the most expert burglar would penetrate all these defences, and certainly the treasures of the Bank of France are better guarded than any in the world.

No. 202.

Scales have been made that are so sensitive to weight that the smallest strand of hair plucked from the eyebrow can be accurately weighed. Two white pieces of paper of equal weight can be placed in the scales, and one's autograph written in pencil on either piece will cause the side with the autograph to go down a little, and the needle, which indicates the divisions of weight even to the ten-millionth part of a pound and less, will move from its perpendicular. These fine little scales are triumphs of mechanism, and are inclosed in glass cases, so that the wind cannot reach them. The glass cases have a sliding door, and as soon as the weight is placed in the balances the door slides down. By pressing a button the beams are raised a little, and the balances are clear and ready for action.

No. 203.

The Archbishop of Canterbury made a good speech in opening a new Polytechnic school a few days ago. He explained that 'its object was not to teach children trades, but to train them in that flexibility and receptiveness of body and mind which would make them much more useful when they began their apprenticeship to any trade—in short, to teach them some general scientific principles, some quickness in grasping scientific ideas, some power to turn their hands to different kinds of work, and their minds to different kinds of study. The Germans,' he said, 'greatly surpassed Englishmen in this sort of flexibility'; indeed, he declared 'that he knew a German village in which every peasant-home and every room is lighted by the electric light.'

No. 204.

One of the glories of the frost before the thaw of Saturday must not be overlooked. Jack Frost, it is known, works secretly, and silently; but seldom does he, in a few hours, weave such marvellous and delicate lacework as that with which he decked everything stationary and inanimate on Thursday last. The crystal coating on twig, leaf, wall, and hedge, was singularly abundant, and past description, lovely in appearance, and rare in detail. Crystal feathers, more than half an inch in length, gathered everywhere, and clothed the tree-clad slopes, and all the graceful lanes, in wondrous winter garments.—(H.M.I.'s TEST.)

No. 205

On the grasshopper's and cricket's forelegs may be seen a bright, shiny spot, oval in form, which has been found to be a true ear. Old naturalists supposed these strange structures helped in some way to intensify the penetrating, chirping sound of crickets. No one for a moment thought they might be ears. Modern naturalists have decided that crickets, bees, ants, and other little animals shall not keep their sense-organs a secret from us any longer; and, although these are often in the least suspected places, still, by careful experiments, they are sure to be discovered, as was the cricket's ear. Some grasshoppers have no ears in their legs, and as a rule these cannot sing.

No. 206.

Addressing a crowded audience yesterday afternoon at St. James's Hall, the lecturer said that 'Lord Tennyson was England's greatest man of letters, and his highest and natural claim was that he was the mirror of the Victorian name. One of his great qualities was his careful and determined choice of beautiful language. Throughout the whole world the English language was spoken, and all in the years to come would remember his efforts to make it perfect. No man in the service of mankind had worked harder than he, who made a minute and careful study of nature, thus giving to the world eyes with which to study nature. No man ever laboured so conscientiously in the interests of his countrymen and women. He taught them to love the country, the fields, and the beautiful streams. That was of great religious importance, for it carried their thoughts back to all that was beautiful.'

No. 207.

A young Indian Prince is described as wearing a scarlet satin coat, bordered thickly with seed-pearls, trousers of gold cloth, a mighty golden fetter round one ankle, heavy diamond bracelets round his wrists, while his neck and breast were blazing with rows and rows of precious stones. More gorgeous and striking than this ceremony, however, was the great procession in the streets with its banners and its guns, its brilliant and varied costumes, its trumpets and kettledrums, horses with silver garlands around their necks, and its State elephants adorned with silver chains and tinkling bells.

No. 208.

The Czar is at the present moment one of the happiest sovereigns in Europe in his private life, though the most miserable in his public relations. He is devoted to his wife and family, and enjoys nothing better than to go out for walks with his children. At the same time, he has suffered great troubles in his family. The murder of his father, the sufferings of his mother, the death of his eldest brother, and the ill-health of his two sons, have all conspired to age him. His own health, moreover, is not very good, and though his muscular strength is prodigious, he would, it is to be feared, succumb very easily to a sharp attack of disease. He is a great walker and a large eater, an indefatigable worker and a keen sportsman.

No. 209.

Forced children are like forced flowers; they may make a brilliant show for a time, but it is at the expense of a vital force which once gone cannot be regained. Like the poor blossoms of the hothouse, they droop and die before their time, while their sisters and brothers of the garden that have been subject to no such artificial pressure live out the natural period of their existence. Too many parents stimulate the mental energies of their children, because of a foolish fear that the world shall think them dullheads; there is no pride more foolish than this. Let every mother and father remember the holiness of the trust that is given them in the care and guidance of a human soul for which they must render a strict account.

No. 210.

We cannot kindle when we will
The fire which in the heart resides,
The spirit bloweth and is still,
In mystery our soul abides,
But tasks in hours of insight will'd,
Can be in hours of gloom fulfill'd.

With aching hands and bleeding feet
We dig and heap, lay stone on stone;
We bear the burden and the heat
Of the long day, and wish 'twere done.
Not till the hours of light return,
All we have built do we discern.

NEW READING TESTS.—STANDARD III.

Suitable for 'Unseen Tests' in Dictation also.

29.—It is said that the Duke of Wellington one day noticed a boy deeply intent on some object on the ground. Going up to the lad, his Grace asked what he was doing. 'I'm feeding a pet toad,' replied the boy, 'but as I have to go to school, it will die.' Now, if the duke loved one thing more than another, it was duty, so he bade the lad go to school, and himself undertook to care for the toad.

30.—A pretty story is told about the sister of the King of Sweden. She recently sold her diamonds to raise funds in order to complete a hospital in which she is interested. When visiting this hospital after its completion, a suffering inmate wept tears of gratitude as she stood by his side, and the princess exclaimed, 'Ah, now I see my diamonds again.'

31.—A lady had two little girls; one, being very pretty, was much admired, and the sister used to be very unhappy at not being equally noticed. So her mother said to her, 'My dear, if you are not so pretty as your sister you can be very good, which is much better.' 'Oh, mamma,' said the child, 'everyone can see how pretty my sister is, but everyone can't know how good I am.'

32.—An old lady visiting a cricket-match for the first time asked her niece, who accompanied her, 'Why that man behind the wicket stopped the balls that the other man wanted to hit?' Soon after the wicket-keeper, caught the batsman out, and some of the players shouted out, 'Caught!' 'Ah! I'm glad they've caught him at last,' said the old lady (thinking it was the wicket-keeper they had caught). 'That makes the ninth time I've seen him stop the ball.'

33.—It is only kind and fair to give the postman all the help one can by always addressing letters in full. Very often people just put on the envelope the name of the person to whom they are writing and of the street, leaving the postman to find out the house as best he can. This means that he has to consult some directory, which delays him in his work, and makes it longer for him.

34.—One day a tremendous roar of rushing water was heard, and a huge wave came on towards the vessel, upturning in its progress and rolling onward with it an immense wall of ice. This was indeed a minute of terrible anxiety, for escape seemed impossible. The rudder was just reached by the advancing foe, and all appeared to be over, when, remarkable to relate, the motion ceased.—(H.M.I.'S TEST.)

35.—The sweetest lives are those to duty wed,
Whose deeds, both great and small,
Are close-knit strands of an unbroken thread,
Where love ennobles all.
The world may sound no trumpets, ring no bells;
The Book of Life the shining record tells.

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SKETCHES OF MODERN EDUCATIONAL REFORMERS.

II.—MATTHEW ARNOLD.

The Apostle of Sweetness and Light.

BY THOMAS CARTWRIGHT, B.A., B.SC. (LOND.),
Author of 'Mental Science and Logic for Teachers.'

THE subject of our present sketch was the eldest son and second child of Arnold of Rugby (his eldest sister is Mrs. W. E. Forster). He was born at Laleham on Christmas Eve, 1822, and was early placed under the fostering care of the Rev. J. Buckland, brother of the eminent geological professor of the same name—a name almost synonymous with love and reverence for nature. In 1836 he was transferred to his father's old school, Winchester, where he became somewhat unpopular on account of adverse criticism against some members of the teaching staff. This soon wore off, and he was estimated at his true worth before his short residence came to a conclusion. It is significant that he won the palm of Rhetoric, for his declamation of the last speech of Marino Faliero, in Byron's drama. In 1837 he was removed to his father's own school, Rugby, where in 1840 he won an Open Scholarship at Balliol College, Oxford, and in 1841 an Exhibition. In the autumn of this year he took up residence at Oxford, where we are told that 'his perfect self-possession, the sallies of his ready wit, the humorous turn which he could give to any subject which he handled, his gaiety, versatility, audacity, and unfailing command of words, made him one of the most popular and successful undergraduates that Oxford has ever known. In his first year he won the Hertford Scholarship for Latin and the Newdigate for English with his 'Cromwell.' The conclusion of his college course was somewhat disappointing, as he only obtained a Second Class in the Final Schools. In 1845 he became Fellow of Oriel—just thirty years after his father had been chosen for the same position. Amongst his friends and contemporaries were Fraser, who became Bishop of Manchester; Buckle, Canon of Wells; Earle, Professor of Anglo-Saxon; and Clough, whose death he lamented in 'Thyrsis'—a poem so beautiful as to be ranked with such threnodies as the 'Lycidas' of Milton, the 'Adonais' of Shelley, and the 'In Memoriam' of Tennyson.

In 1847 he left Oxford and became secretary to the Whig minister, Lord Lansdowne, and in the succeeding year published anonymously 'The Strayed Reveller and other poems, by "A."' Shortly afterwards he espoused the daughter of Mr. Justice Wightman, which step, as he informed the Westminster Teachers, when receiving a farewell present many years later, caused him to resign his secretaryship and to become one of that august body, the Inspectorate. In the interval between giving up the secretaryship and becoming H.M.I.S. he, for a few months, was an assistant master at Rugby. In 1851 he became Inspector of British Schools. In 1859 he was sent abroad as Foreign Assistant Commissioner to inquire into the state of education in France, Germany, and Holland, and six years later he was again on the Continent on the same errand. In 1867, he embodied the conclusions resulting from his travels in a volume, wherein we see him striving to give an answer to the question—how to make the English middle-class school less contented with commonplace ideals, *i.e.*, less Philistine, as he termed it—and, until death, this grand problem of the organisation of secondary education occupied his attention, which of itself would be sufficient to entitle our subject to inclusion in this 'Reformers' Corner.'

The one crying want of England was, and still is, this same organisation. Its absence and the consequent chaotic condition of middle-class education fully accounted, in Arnold's estimation, for the prevailing national faults, moral, social and political. 'Porro unum est necessarium' was his favourite expression, and that one thing was to be the systematic and thorough education of the middle classes in the direction of 'sweetness and light' and away from the prevalent debasing Philistinism. That there should be a school for licensed victuallers, a school for commercial travellers, a school for Wesleyans, and a school for Quakers, was disastrous, 'for to educate a middle class in this way is to doom it to grow up on

an inferior plane, with the claims of intellect and knowledge not satisfied, the claims of beauty not satisfied, the claim of manners not satisfied.' 'Twenty-two Liberal engagements,' he exclaimed, 'and the reform of middle-class education not one of them,' and he complained similarly of the apathy of Conservatives in this direction. 'It is,' says his *Times* biographer, 'one of Arnold's chief claims to the regard of his countrymen that, in spite of the indifference of party leaders, he continued to the end to press with all the force of exhortation and irony of which he was master for this most penetrating of all reforms.' In 1857 he was elected Professor of Poetry at Oxford and he occupied this position for ten years. Of his publications in this place we need not speak, except to say that they were always of a high order. The writer well remembers with what emotion he read in the PRACTICAL TEACHER, some ten years ago, the pathetic tale of the 'Deserted Merman,' which feeling was intensified upon more intimate acquaintance with the writings of the maestro; but we must mention his 'Essays on Criticism' which appeared in 1865, in which a new spirit of criticising was evident, consisting in 'a disinterested endeavour to learn and propagate the best that is known and thought in the world,' and in which was shown a prevailing desire to 'shake off convention and see the thing itself.' His efforts were noticed not only in England but in France, where Sainte Beuve speaks of him as a young poet 'dont la talent réunit la pureté et la passion.' In his lectures at the Royal Institution, in provincial towns and during his two visits to America, he uniformly endeavoured to set the tide of popular opinion in the direction of higher and nobler aims and sanctions; and by so doing he well earned his noble title, 'The Apostle of Sweetness and Light.' Latterly he set himself to find a means of retaining what was essential to religion while giving up that which modern thought held to be unessential, with which aim in view he wrote 'Literature and Dogma,' 'God and the Bible,' 'Last Essays on Church and Religion.' In this he was unsuccessful, as might have been anticipated. His sudden death on Sunday afternoon, April 16th, 1888, will be fresh in most of our minds, as well as the dismay which it caused. We now proceed to discuss his work as a Reformer in matters educational, and more especially in their bearing upon primary teachers. Aiming, as this magazine does, at the betterment of all sections of teachers, wishing for better staffing and better payment and better conditions all round for the rural, it also ardently desires an upward movement for the men who, by patient study and earnest work, have put themselves at the head of our profession. In a word it demands, now as ever, that a rational career shall be opened to teachers by the removal of the unjust and artificial barriers which, set at the entrance to the Inspectorate and work in Grammar Schools, stridently cry 'thus far and no farther,' to the primary teacher on the slender grounds of social inferiority. Arnold cried out for the organisation of secondary education. At last his cry has been heard, and Mr. Acland seems bent on initiating a movement which will end in the establishment of well-organised secondary schools. Let the primary teacher see to it that he is not jostled out of the running for work in these schools on any other grounds than professional inferiority.

Arnold rightly insists upon the all-importance of good organisation, but first and foremost in influence he puts the character of the master. 'Next after the character of the master (long after it, certainly, but next after it) . . . . is organisation. Hence the master should be well trained and should have a free hand. The teacher to whom you give only a drudge's training will do only a drudge's work, and will do it in a drudge's spirit.' Again: 'More free play for the inspector, and, in consequence, more free play for the teacher.' 'It is my strong hope that it will soon become the rule for every young schoolmaster in my district to matriculate at the London University. The teacher, as I have often said, should be fettered as little as possible, and our codes tend to fetter him too much.'

As to the curriculum, his views were decided: 'In general, our school children from eight to ten should all be receiving instruction in these eight matters:—Reading, writing, arithmetic, poetry, grammar, geography, elementary science, and music. Our school children from ten to thirteen should all be receiving more advanced instruction in these eight matters, with history, as a ninth matter, added. And a picked few of these older children should be taught, further, the rudiments of French and Latin and elementary geometry.'

As regards individual subjects, Arnold over and over again defends grammar and poetry—the former as a training in logic; the latter as being of a formative, nature and of vital importance for culture. He deplores the inferior verses which are put forward as poetry, and suggests that any extract learnt should have a climax, even if beginning in the middle be rendered necessary thereby.

Spelling reform gets scant encouragement at his hands, and free education meets a like fate. On the subject of weights and measures he says: 'Our system is such an absurdity that one is disposed to say reform it altogether, rather than to suggest means for working sums in it with more facility.' Still, he recommends actual contact with the actual weights, etc., as a great help. 'It is the opinion of many persons of the present day that every child should be taught to draw, as every child should be taught to read and write. It may be so; but I will venture to express my hope that they may, at any rate, be taught to read and write first.' Not a very enthusiastic championship of drawing.

He approvingly quotes Butler's pregnant remark that—'Of education, information itself is really the least part'; and in this connection he, himself, thus holds forth:—'Governing the teacher's whole design of instruction should be the aim of calling forth, by some means or other, in every pupil a sense of pleasurable activity and of creation; he should resist being made a mere lader of information.'

Speaking of the scholarship examination, he says:—'Why should not the yearly syllabus, which gives notice to the students in training colleges of the matter in which they will be examined, name some short classical work of English poetry to be read by candidates for admission, and from which the passage for paraphrase, and one or two questions, will be taken?' In the name of common sense, why not? will be the ejaculation of all who have to train scholarship candidates.

But perhaps the most striking fact in proof of our reformer's sagacity in connection with elementary

education was his outspoken and uncompromising opposition to that expiring dog—payment by results—and we shall conclude our fragmentary sketch by quoting a few utterances in testimony of this statement :—

1867.—'I feel sure from my experience of foreign schools, as well as of our own, that our present system of grants does harm to our schools by resting its grants upon an individual examination.'

1869.—'The real question is, and it is eminently a question for educationists, since the general public has neither care nor skill for it, and is sure to be perfectly satisfied as soon as it hears of *paying by results*. The real question is, whether we have not overdone this sort of examination (the individual) by attaching to it so overwhelming a share of our grants, and consequently so overwhelming an importance.'

1871.—'I have never concealed from your lordships my opinion that our mode of *payment by results*, as it is called, puts in the way of the good teaching and the good learning of these subjects almost insuperable difficulties.'

1880.—'It is not my province to discuss our present mode of making grants, which leads to such difficulties in forming a proper programme of school instruction.'

Such persistent and repeated attacks must have done much to bring about the desired reform, and of Matthew Arnold we may truthfully say, 'he helped to kill payment by results.'

As a last word, we cull a remark upon the effects of examination. 'All test examinations may be said to narrow reading upon a certain point, and to make it mechanical. . . . This is why our University system of examinations, competitions, and honours is so little favoured in Germany. The least studious of German countries, Austria, is the one most abounding in University examinations like our own. 'Le pays à examens, l'Autriche, est precisément celui dans lequel on ne travaille pas,' says M. Laboulaye.

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AN EXAMINATION IN WOODWORK IN AN ELEMENTARY SCHOOL,

BY THE

SCIENCE AND ART DEPARTMENT.

UNDER the regulations issued by the Department, the annual examination in Woodwork takes place at the same time as the annual Drawing examination. The Department send down an Inspector, who may, if he pleases, bring with him an expert to judge the practical part of the work ; but in my own case the Inspector judged and reported on every part of the work himself.

The morning was occupied with the ordinary drawing examination. I was requested to 'parade' the woodwork boys in the playground at 2.30 p.m. The formation was to be in three lines of equal numerical strength, but the front line to be composed of sharpest lads, the rear line of the backward ones, while the middle line included those of medium abilities. Altogether sixty-nine paraded.

Punctually at the time appointed the Inspector came down, and made a selection from the three lines. He chose about half the number of those present, and endeavoured to be as fair as possible in the choosing.

The lads then marched up into the Slöjd-room, and were again divided into three sections—one for bench work, another for drawing, and a third for sawing, boring, sharpening tools, etc.

The boys, standing at attention at their separate benches, each received a piece of wood about $1' 1'' \times 2'' \times \frac{7}{8}''$. Before commencing work they were put through a plane drill, and questioned on the tools and wood before them. Each lad was required to 'true up' the piece of batten to $12'' \times 1\frac{7}{8}'' \times \frac{3}{4}''$, and then bring it up to the Inspector to be tested.

While they were working, the drawings of models and exercises done during the year were examined and commented on by the Inspector. He chose about twelve different drawings, showed them to the lads, together with the corresponding exercises in wood, and asked them to draw plan, elevation, and isometric projection of each. The joints were :—half lap joint, angle bridle joint, angle halving joint, cross halving joint, housed joint, and the first four exercises in Barter's system ; viz., sawing and chiselling exercises, simple inlaying and chamfering.

All drawings were made to half scale, and the Inspector was particularly anxious that the boys should make drawings from the model or exercise before them, with actual measurements of the same.

The woodworking boys having brought up their pieces of wood 'trued' to dimensions, were now told to make certain joints and exercises.

Two commenced upon angle-halving joints which were to be pegged when finished ; another two had lapped halving joints to make ; while another pair were set upon angle bridle joints.

One lad had a fresh piece of wood $12'' \times 1\frac{1}{2}'' \times 1\frac{1}{2}''$ given to him, and he was requested to plane it up into the form of an octagonal prism, and afterwards make it into a round ruler. He did his allotted task in wonderfully quick time, and presented a really good ruler to the Inspector at the finish.

The remaining exercises were set from Barter's book, and consisted of horizontal chiselling, simple inlaying, and chamfering. One good feature in the examination was this :—The Inspector took it for granted that what boys had done during the year, they could at any rate attempt on that day, and wished to see them try. Of course, had work been shown which had not been actually done by boys, the result would have been disastrous. As it was, the lads did their best, and notwithstanding that they belonged to a particularly poor neighbourhood, and were for the most part undersized and badly fed, yet did themselves credit.

The boys who were assigned to the sawing stools were required to saw both along and across the grain to a line. The plank was of pine, about $\frac{1}{2}''$ thick. Two lads were given a plane-iron, and told to grind it on grindstone. It was afterwards tested, and assessed as fairly-well done.

The work at the benches occupied about one and a half hours. The joints were collected and examined critically by the Inspector who, I suppose, assessed them as excellent, good, or below par ; but as to the general result he was wisely reticent.

Some questioning on the growth, seasoning, and uses of timber followed. The boys were asked for the

names of the most common timber trees in England, from what countries we import timber, and what were the characteristics of different kinds. Finally the boys were dismissed, having had three hours very fair testing in nearly every part of the work which had been done during the year.

The registers were next checked and certified as correct; but an adverse remark had to be made on the report because of the absence of managers from the examination, and also because the registers had not been checked during the year. The Inspector said this must be done as in day school. Thus amicably and satisfactorily passed off my first examination in woodwork under Science and Art Department regulations.

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ELEMENTARY LESSONS IN HORTICULTURE.

BY PROFESSOR J. R. GREEN, M.A.,

Examiner in botany to the University of Cambridge, and F. L. Green, Late Science Mistress in the Clifton High School.

I.—The Seed and its Germination; the Preparation of the Seed Bed.

The Code very justly, in the scheme of Plant Life with which it heads its syllabus, places first the consideration of the nature of seeds and their germination, for the seed in the economy of the plant holds a unique position. It is the link between the old and the new individual. It springs from the old individual, the parent plant; it contains within itself the dormant germ of what, under favourable conditions, will be a new plant.

Starting, then, with a definition, the seed may very well be described as a new but dormant individual, containing within itself the resting rudimentary plant, or *embryo*, together with the food materials necessary for the resumption of active life under the influences of moisture and warmth.

Seeds are very generally classified according to the mode of distribution of their food materials. The common bean is an easily examined and typical example of what are called *exalbuminous* seeds, from a reason we shall see shortly. If a bean be soaked in water for about twenty-four hours, it will swell slightly, and its parts will be readily discernible. A small knife and a needle or two will be all that will be required for its dissection. The most casual observation will disclose a black patch at one end of it. This is known as the *hilum*, and marks the place at which the bean, was attached to the pod. Now, close to the part of this patch which is next the broad end of the bean, a minute drop of water will be squeezed out if the bean be carefully pressed. The moisture oozes from a small opening in the *testa*, or skin, through which, when the seed was young, the tube or outgrowth from the pollen grain of the stamen entered it to fertilise the germ cell. This orifice is called the *micropyle*. If the testa now be carefully slit open and peeled off, there will be found remaining two large fleshy lobes which are pressed face to face, but are not adherent. These fleshy masses are called *cotyledons*, or seed-leaves, and their thickness is due to the masses of food material therein stored up for the use of the young plant. Between the two cotyledons there will be seen an axis, at the one end of which is the rudimentary root, or *radicle*, lying outside the cotyledons and pointing towards the micropyle, and at the other the rudimentary stem, or *plumule*, which is folded inward, and, being hidden by the cotyledons, can only be seen when one of the cotyledons is removed from the embryo. All leguminous seeds (sweet pea, vetches, broom, etc.) and all cruciferous seeds (wallflower, stock, candy-tuft, etc.) are of the same type as the bean.

If the seed of the buckwheat be now examined, an additional structure will be seen besides the embryo and the testa. It should be soaked for a time in water, for the so-called seed is really a hard, dry fruit, whose wall—the black outer skin—must be removed either with knife or needle in order to show the true seed. The testa or skin of the seed is thin and delicate, and the micropyle, instead of being near the hilum, is at the apex of the seed. On the careful removal of the testa a white mass will be disclosed, which, when carefully scraped with a needle, will show a yellowish body placed rather to one side of it. This is the young plant or embryo. Its cotyledons, instead of being thick and fleshy like those of the bean, are thin and leathery, and are rolled round part of the floury white matter which forms the reserve food store. The matter in which the embryo is embedded is called the *endosperm*, or *albumen*, and seeds exhibiting this feature are therefore called *albuminous*. The seeds of the clematis, anemone, pæony, lily, crocus, iris, pink, and many other garden plants are of this type. The seeds of the bean, sweet pea, etc., are said to be *exalbuminous*, because they do not contain any endosperm or albumen. The endosperm is often fleshy or horny in its consistence, instead of being floury as it is in the buckwheat.

An important modification of the albuminous seed takes place in the case of grasses and cereals, garden examples of which may be found in the ornamental maize (*Zea japonica variegata*), love grass, Job's tears, feather grass, and squirrel's tail. The seed of the maize is more difficult to examine than those hitherto dealt with, because its testa, or skin, is adherent to the *pericarp* or outer wall of the fruit, and the endosperm is closely attached to the rind thus formed. It is advisable to soak it, when a section through the grain will show the relative position of its parts. On the side of the grain there will be seen a white patch, oblong in shape. This indicates the position of the embryo, and a clean section made through this patch will show its structure, but so minute are the parts that a microscope will be necessary for their identification. It will then be seen that part of the embryo has developed into a curious, shield-shaped body, the *scutellum*, which is so placed as to separate the young plant from the endosperm. The scutellum is covered on the side facing the endosperm by a peculiar, delicate coat known as the *epithelium*, which, as we shall see, has a very important part to play in the processes of germination. Unlike the seeds hitherto examined, the embryo has only one cotyledon, or seed-leaf, and is therefore *monocotyledonous*, while those with two seed-leaves are *dicotyledonous*—a point necessary to be noticed in the classification of plants.

Having thus briefly examined the structure of the seed in its three main forms, it will now be necessary to inquire more particularly into the nature of the reserve materials stored up in the embryo for the development of the young plant. The nutritive materials for the

use of the embryo, whether in the endosperm or in the embryo itself, are stored in cells. We must first determine, then, the nature of a cell.

The simplest form of vegetable cell is generally polygonal in shape, and consists of three parts: (1) A limiting membrane, which separates it from its neighbours, and is called the *cell-wall;* (2) a layer of living substance, which lines the cell-wall, and is known as *protoplasm;* (3) a central cavity called the *vacuole.* The cell-wall in young cells is uniformly composed of a substance similar to starch in its composition, which is called *cellulose.* It is transparent, elastic to a certain extent, capable of some amount of stretching, and permeable by water. The essential part of the cell is the protoplasm, which carries out all the vital processes. It has embedded somewhere in its substance a body called the *nucleus*, and besides forming a lining to the cell often extends across it from side to side, in the form of bridles or bands, thus dividing the vacuole into smaller cavities. Like the cell-wall, it is somewhat elastic and expansible, but is less freely permeable. Water passes through it readily, but the different substances held in solution in the water cannot do so as freely, the protoplasm acting as a regulator of the passage of various substances into and out of the cell. The vacuole contains a fluid known as the cell sap, composed of water holding in solution many different substances, inorganic salts, sugar, vegetable acids, colouring matter, etc. The pressure exerted by the sap keeps the protoplasm in contact with the cell-wall. If the protoplasm were freely permeable, the constituents of the cell sap would easily be washed out of the cells by prolonged soakage.

There are three great classes of food-stuffs stored in the cells for the use of the embryo. They are (1) such carbohydrates as starch, and (2) albuminoid or proteid matter, (3) fat or oil. Starch is a very commonly occurring body. It is deposited in the form of grains, the shape and size of which vary with the plant in which they occur. Many of them show a concentric striation, as if they were built up by the deposition of layer on layer round a central mass. The albuminoid matter, or proteid, is often found in masses which are called aleurone grains; their structure varies. In the lupin and other leguminous plants, they occur embedded in a matrix of protoplasm, from which they can be separated by solvents. In the castor-oil seed they are very complex, consisting of an egg-shaped mass in which are embedded a crystalloid with well defined edges and mineral matter, chiefly a double phosphate of calcium and magnesium. Occasionally, as in the seeds of palms, proteid matter is found not in grains but in an amorphous form. Proteids are nitrogen containing material. Oil is usually found saturating the protoplasmic or proteid network in the cells. All three forms of reserve material may occur in the same seed, but as a general rule, starch is not found in seeds that are rich in oil.

Starch, proteid, and fat, all resemble each other in two important respects. They are insoluble in water, and incapable of dialysis or diffusion, a process of great importance to the plant. Sugar, on the other hand, is dialysable, as may be readily seen by an experiment. Let a solution of sugar be placed in a vessel whose bottom is composed of parchment paper, and which has no aperture, and then let the vessel be floated on a basin of water. Soon, a stream of water will be found to pass through the membrane in the direction of the sugar, while a smaller amount of sugar solution will pass through to the water, these two movements continuing till the fluid on either side the membrane is of equal concentration. Now if a solution of proteid matter (white of egg is a convenient form), or a layer of oil, or a solution of starch, be placed on one side of the membrane, while water is on the other, it will be found that none of these three substances can pass through to the water; they are not dialysable.

It is in virtue of dialysis that food material passes from cell to cell within the embryo, a stream setting in between a cell in which any material capable of dialysis is accumulated and the neighbouring cell till both are equally saturated. Thus the accumulated material is gradually dispersed through the embryo till it is consumed at some definite point. As in the process of germination under the influence of moisture and warmth the embryo or young plant is found to grow and develop concurrently with the disappearance of its reserve materials, we have now to determine how the insoluble and indiffusible food materials stored in the cells are converted into such related forms as are capable of being dissolved in water or sap, and can pass through the walls of the cells.

Germination may be defined as the process of digestion and assimilation by the seed of the food materials deposited within or near the embryo. We shall find that it is a process mainly set up by vegetable ferments, and dependent on their working.

With our present knowledge we cannot readily define a ferment, but all ferments possess the following characteristics: (1) They occur in extremely minute quantities; (2) Their activity is dependent on their exposure to a certain limited range of temperature; (3) A high temperature, such as that of boiling water, results in their total destruction; (4) Their activity does not produce any change in them, nor does it destroy them; (5) They do not themselves enter into the composition of the bodies which they produce; (6) By the accumulation of the products of their action their activity is much impeded and at length stopped.

To study the transformations of our first group of food-stuff, the carbohydrates, starch, sugar, and cellulose, the germinating seed of barley (or other cereals), should be submitted to microscopical examination. Under the microscope the delicate coat, or epithelium, of the scutellum will be seen to consist of a layer of cells columnar in shape, against which the endosperm is pressed closely. Now the endosperm is made up of a mass of thin-walled cells, whose interior is packed full of starch grains. When germination takes place, the walls of these cells first swell up and dissolve, a process which always begins immediately under the cells covering the scutellum and extends gradually throughout the endosperm. Next, the starch grains immediately under the scutellum become pitted on their surfaces, the pittings increasing gradually and becoming deeper till the grains are irregularly broken up when they become dissolved, the starch having been converted into a form of sugar, soluble in water. It has long been known that the disintegration of the starch just described is due to the action of the ferment known as diastase, and recently Brown and Morris have discovered that the disappearance of the cell-walls also results from the action of a ferment. Both these ferments originate in the delicate coat, or epithelium of the scutellum. The action of the ferments

may readily be seen by experiments. First, with regard to the behaviour of the diastase. If the embryos of a number of germinating grains be dissected out and ground up with a little water containing a trace of chloroform, in order to prevent the growth of bacteria in the mixture, and the solution, after standing a day, be filtered, a clear liquid will result, containing diastase. If this solution now be mixed with a certain quantity of thin starch paste in a tube containing about one per cent. of starch, on exposing it to a temperature of about 104 F. the starch will be found to gradually vanish, and the mixture to contain a quantity of sugar proportionate to the starch which has disappeared. A solution of the other ferment can be similarly prepared, and will be found to dissolve cellulose, for if a thin section be cut from a potato and immersed in the solution, the walls of the cells in the course of a few hours will be seen to become swollen and gradually dissolve. The resulting product, there is little doubt, is a form of sugar. That the sugar thus produced are materials upon which the young embryo feeds has been proved by Brown and Morris in the course of some interesting experiments. They dissected out young embryos that had just begun to grow, and fed them on solutions of the different sugars. The embryos absorbed the solutions and continued to grow and develop.

We have now to consider the transformations of the second class of food-stuffs, proteids. Their behaviour is conveniently studied in the case of lupin seeds, where they occur in the form of aleurone grains. These grains are composed of a *globulin* (which heating changes into a very insoluble form of nitrogenous matter called coagulated proteid) and an *albumose*, which in solution is precipitated when a drop of nitric acid is added to it, the precipitate dissolving on the heating of the tube and reappearing on its being cooled. The aleurone grains in the lupin occur in the cells of the tissue of the large fleshy cotyledons. Before the commencement of germination, the grains embedded in a mass of protoplasm occupy about half the cell and have sharp distinct outlines. When germination begins, they swell slightly, lose the definiteness of their outline, and gradually dissolve till they entirely disappear, leaving the network of protoplasm, which is seen to contain large cavities, filled with cell sap. We have already found by experiment that these proteids are insoluble in water and incapable of diffusing through a membrane. As the aleurone grains do pass out from cell to cell, they must undergo a transformation into a diffusible form. The germinating lupin seed, if extracted with a weak solution of common salt, or with glycerine, will be found to give up a ferment, which, from the similarity of its action to that of the ferment in pancreatic juice known as *trypsin*, may be called *vegetable trypsin*. The first product of the action of this ferment is a proteid soluble in water and capable of diffusion through a membrane. It is known as *peptone*. Peptone does not appear in any amount in the growing plant, being decomposed further under the influence of the ferment into *asparagin*, a peculiar acid body containing nitrogen, which crystallises from its watery solutions in comparatively large rhombs. The ferment cannot change proteids if the fluid be alkaline, and it requires a faintly acid medium for its energetic action. Now the sap in a germinating seed, though neutral at first, soon changes to a faintly acid reaction. It remains to notice that the ferment in the lupin is formed once for all in each cell where the reserve materials are stored.

The behaviour of the third class of food-stuffs is well seen in the seed of the castor-oil plant, the quantity of fat present amounting to nearly sixty per cent. of the dry weight of the seed. The cells of the endosperm contain a number of aleurone grains more complex in their composition than those of the lupin, but whose assimilation proceeds on almost identical lines. The protoplasm lining these cells in which the aleurone grains are embedded is saturated with oil. Fats are complex bodies made up of a combination of fatty acids with glycerine. The first decomposition that is traceable in the germination of the castor-oil seed is the liberation through the action of a ferment of the fatty acid from the glycerine. If a germinating seed be added to a very weak soda solution and the extract filtered, a soda soap will be formed from which, on the addition of a little sulphuric acid, the fatty acid will separate out as a thick greasy fluid insoluble in water, and incapable of dialysing through a membrane. This transformation is only a preliminary one. On examining a castor-oil seed after about five days of development it will be seen that the young embryo has considerably increased in size, its primary root protruding for about a couple of inches, and bearing a number of secondary rootlets which vary in length. Inside the endosperm, which has become swollen and contains a quantity of water, are the cotyledons, through which the food material is absorbed. The endosperm at this period contains a certain quantity of the unaltered oil, some fatty acid, an acid which, when the endosperm is soaked in water, is extracted and can be made to crystallise, and sugar. The glycerine formed with the fatty acid seems to be absorbed as soon as formed, and to be the source of the sugar. Later in the history of the embryo, when the reserve materials of the endosperm are almost exhausted, the crystallisable acid and the sugar are the only constituents left in the cells. The transformation of the glycerine into sugar, and of the undialysable, fatty acid into dialysable acid, does not result from the action of a ferment; it results from the continued activity of the protoplasm of the cells of the endosperm. Let us look at the life history of the endosperm. In all seeds, without exception, before maturity, there exists a living endosperm surrounding a living embryo. In exalbuminous cells, like the lupin, the contents of the endosperm are absorbed by the embryo before the resting stage, the endosperm disappearing. In the case of cereals, the endosperm cells fill themselves with starch and other products. Then their activity ceases. If the embryo be dissected out the endosperm will undergo no change. The energy of the endosperm of the castor-oil seed is not exhausted by the accumulation of aleurone grains and oil in its cells. Its protoplasm retains the power of transforming the food thus stored into forms capable of assimilation by the embryo.

It remains to consider the external conditions of germination before passing to the consideration of the practical question of the formation of the seed-bed. One of the chief of these conditions is moisture; another, warmth. If an extract of the seeds of the lupin, in which germination has not yet begun, be made, it will not decompose its proteids, nor will an extract of the resting-seed of the castor-oil plant separate the oil into glycerine and fatty acid

Now warm the castor-oil extract for an hour or two, with a little much-diluted acid. The ferment will make its appearance. The seed, before germination, then contains in its cells something, which though not a ferment under favourable conditions can be transformed into it. To this substance the name of *zymogen*—'mother of ferment'—has been given. Now when the seed is sown, it comes under the influences of warmth and moisture. Its reaction then, instead of being neither acid nor alkaline, as in the resting stage, changes to a faintly acid one, certain vegetable acids being formed. The vegetable acids convert the zymogen into an active ferment, and the conversion and transportation of the food materials towards the seats of growth or of absorption immediately set in. Light also is an essential of germination. When lupins are grown from seeds in darkness their tissues are charged with asparagin, and their growth stops after a time. Then if they are exposed to light and supplied with air, the asparagin disappears and their bulk begins to increase. The cessation of growth in the darkness is due to the non-supply of carbohydrate, which the plant can only form in the light.

Half-hardy and tender plants must in our climate be raised under glass, but hardy annuals (plants usually of no great size, which die after a season's growth, and require to be sown annually), hardy biennials (plants which live for two years, flowering the second year), and hardy perennials (plants which live for more than two years) are usually raised out of doors in a seed bed. We have seen that moisture, warmth, and air are essentials of germination; a seed-bed must therefore be constructed so as to secure these conditions to the seed. For annuals, both spring and autumn sowings are resorted to.

Most hardy annuals, mignonette, nasturtiums, candy-tuft, etc., are finer when sown in September than when sown in the spring, but they often then become the prey of that ruthless garden enemy, the slug. An autumn seed-bed should be in an open situation, far removed from fences, walls, and slug-sheltering crops. Spring sowings for a succession of bloom should be made in March, April, and May. Biennials (campanulas, fox-gloves, etc.,) and perennials (wall-flowers, snapdragons, etc.) may be sown from April to July. They require to be planted in their permanent quarters where they are to flower before the end of September, so that they may get well rooted and established before severe frosts set in.

The position of the seed-bed being decided on, the ground should be well dug and pulverised to the depth of from twelve to eighteen inches, and as the work proceeds, abundance of thoroughly rotten manure, or leaf-soil, should be added, that the roots of the seedlings may be able to strike freely into the soil and there find plenty of nourishment, while the water, instead of collecting in a stagnant condition, drains away. The surface of the seed-bed should be made level, that the seed may be equally distributed in the sowing. Seeds may be scattered broadcast, or sown in drills, or put into the earth one by one with a dibbler. Whichever plan is adopted they should be sown thinly, in order to secure vigour to the seedlings. If the earth be dry it will be advisable to water it freely some hours before sowing the seed. The seed should be gently pressed into the earth and lightly covered with fine sandy soil. It is important that the covering soil should be well pulverised and porous, in order to admit of free quick growth during and after germination, and by the uniform and healthy circulation of water to preserve the surface soil from becoming stagnant under the influence of repeated after-waterings. Until the seeds have well germinated, if the weather be dry, it is advisable to shade the seed-bed with a light surface protection, such as moss, or the boughs of evergreens, but when growth commences, the covering should be removed, or the seedlings will be weakened through a deficiency of light and air. Wood ashes are often used as a covering for seeds, to check the ravages of birds and mice. Seeds are sown at different depths, strong-growing seeds, like those of the sweet-pea, being put in at a greater depth than minute seeds like those of the forget-me-not. The smaller the seed, the lighter should be its covering. In ordinary garden practice, many common seeds (*e.g.*, mignonette) are simply raked into the border without the intervention of a seed-bed.

Where seeds have not been dibbled into the ground, the operation of thinning must be resorted to, in order to admit of a sufficient supply of air, and light, and root development to each individual. The transplanting of seedlings also results in their increased vigour. It is best undertaken in showery weather, their growth then receiving a minimum check.

To briefly recapitulate: We have now seen that—

1. A seed contains within itself a resting rudimentary plant and the food materials necessary for the resumption of active life under the influences of moisture and warmth.

2. Seeds are either albuminous (containing a store of reserve material in a development of cellular tissue, called the endosperm or albumen) or exalbuminous (containing an embryo, or resting rudimentary plant only, the cotyledons or seed-leaves acting as store-houses of the reserve material). An important modification of the albuminous seed is found in grasses and cereals—the endosperm being separated from the embryo by a curious shield-shaped body, whose delicate coat secretes ferments which have an important part to play in germination.

3. An embryo consists of a testa or skin in the surface of which is an orifice called the micropyle, one, or two, cotyledons or seed-leaves, according to the nature of the plant, a rudimentary root or radicle, and a rudimentary stem, the plumule.

4. The nutritive matters intended for the use of the embryo are stored in cells. Every cell is separated from its neighbours by a cell-wall composed of cellulose, a substance similar to starch in its composition, and permeable by water. The cell-wall is lined with protoplasm, which carries out all the vital processes, and acts as the regulator of the passage of various substances into and out of the cell. The central cavity of the cell, or vacuole, contains the cell sap, composed of water containing different substances in solution.

5. Three classes of food-stuffs are stored for the use of the embryo—carbohydrates, such as starch and cellulose; proteids, containing nitrogen; and fat or oil. They all agree in being stored in forms insoluble in water and incapable of diffusion through the cell-wall.

6. Under the influence of warmth and moisture, dialysis, or diffusion, sets in, the insoluble and indiffusible food materials stored in the cells being con-

verted through the action of ferments into related soluble and diffusible forms.

7. Germination is the process of digestion and assimilation by the seed of the food materials stored in or near the embryo. The resting seed contains zymogen, instead of ferment, and the onset of germination is brought about by the conversion of the former into the latter.

8. The absorption of water is a necessary antecedent to the process of germination, for water on gaining access to the cells sets up changes in the living substance in consequence of which certain vegetable acids are formed, which convert the zymogen present in the cells into active ferments. The conversion and transportation of the food materials towards the seats of growth or of absorption immediately follow. Warmth is also essential to germination, its action being a factor in the transformation by the vegetable acids of zymogen into active ferments. Air also is a necessary accompaniment of germination, the seed absorbing free oxygen.

9. In forming a seed-bed, a suitable aspect and rich, well-drained soil are essential. The covering soil should be light and porous, in order to admit of free, quick growth during and after germination. The seed should be sown thinly, and thinning and transplanting are useful in securing vigour to the seedlings.

(To be continued.)

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QUICK'S EDUCATIONAL REFORMERS.

BY THOMAS CARTWRIGHT, B.A., B.SC. (LOND.)

Author of 'Mental Science for Teachers,' Notes on Spencer's Education, etc. Co-Director of the Birkbeck Training Classes for Teachers.

THE pedagogics set for the Second Year Candidates at the 1893 Certificate Examination is either Spencer's Education, Chaps. I and II., or Quick's Educational Reformers, Chaps. XIII., XVI., XVII., and XVIII., which deal with Locke, Pestalozzi, Frōbel, and Jacotot. In the numbers of THE PRACTICAL TEACHER for October, November, and December of last year, Spencer was annotated. We shall now proceed to examine Quick's Reformers—a labour of love, for we yield to no one in esteem for the genial, kindly, sympathetic, and, withal, acute critic, who has given to teachers one of the most readable and helpful books to be found in any language.

Quick informs us that only three English writers on pedagogics have been thought worthy of attention by the world of pedagogues. These are Ascham, Locke, and Herbert Spencer. To these the Americans would probably add Quick, for nowhere has his work been more appreciated than in the United States. Some months ago the editor of this magazine, who is always on the alert for anything likely to interest, elevate or amuse teachers, and who is himself also an admirer of Quick's work, commissioned us to write a series of sketches of modern educational Reformers, conspicuous amongst whom was to be the Rev. H. R. Quick. We shall therefore refer the reader to the forthcoming sketch of our author for personal details, and for a *résumé* of his work.

From the perusal of the various chapters in his book the author hoped that his fellow teachers would reap a double advantage. In the first place, 'it may lead some teachers to the study of the great thinkers on education. There are some vital truths which remain in the books which time cannot destroy. . . . So long as this book is used, it will, I hope, be used only as an *introduction* to the great thinkers whose names are in it.'

In the second place, 'by considering the thinkers in chronological order, we see that each adds to the treasure which he finds already accumulated, and thus, by degrees, we are arriving in education at a *science*. In this science lies our hope for the future. Teachers must endeavour to obtain more and more knowledge of the laws to which their art must conform.'

Starting from the Renascence or Birth of the New Learning—brought about by the fall of Constantinople in 1453, and the consequent scattering of the Greek language and literature in the countries of Western Europe and the almost simultaneous discovery of the art of printing—we will endeavour to briefly show what was the progress of education until the advent of Locke, to the end that a full appreciation of the value and effect of the 'Thoughts concerning Education' and the 'Conduct of the Understanding,' etc., may be obtained and a just appraisal of the Reformer Locke be made.

The immediate effect of the New Learning was 'the idolatry of books.' 'So the schoolmaster fell into a bad conception of his task, for he supposed that his function was to teach Greek and Latin, and his chief implements were grammar and the cane.'

The Jesuits were the first to make an improvement which they accomplished by putting sympathy in the place of the cane and, although their ideal of education was still the inculcation of Greek and Latin, they were more successful than their predecessors, because they made an effort to secure the affection and interest of their scholars. It is to them that the maxim 'Repetitio mater studiorum' is due.

A real advance was made by Rabelais who, later on, was vigorously and eloquently seconded by Montaigne. The in-cramming of knowledge and consequent lack of training and development of faculty, except of the verbal memory, was derided, and development in all directions was pointed to as the teachers' goal. 'We labour to stuff the memory, and in the meantime leave the conscience and understanding impoverished and void.' ''Tis not a soul, 'tis not a body we are training up, but a *man*, and we ought not to divide him.'

The next impetus was given by the propagation of Bacon's philosophy, as enunciated in his Novum Organum, or New Instrument for the discovery of the truths and laws of Nature, which contended that by examination of things alone can the laws that govern their being come to light, so that 'things not words' began to be the battle-cry of the Reformer in matters educational. Comenius, the Moravian, who distinctly avowed his indebtedness to 'the noble Verulam,' was the greatest of the pioneers of the fifteen hundreds. His theory is quite different from the pouring-in theory, and seems to anticipate the notion of Frōbel, that the educator should be called not '*teacher*,' but '*gardener*.'

This scanty account must suffice to indicate the current of pedagogic reform prior to the birth of Locke, which event took place in 1632.

Next month will appear a short epitome of our

Reformer's Life, together with a succinct statement of the points in which his doctrine of education, when reviewed from our modern standpoint, seems sound and worthy, followed by a criticism of those portions of his pronouncements which have been weighed in the educational balance and found wanting.

(*To be continued.*)

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TACT
IN THE BUSINESS OF SCHOOL-KEEPING.

BY RICHARD BALCHIN.

'TACT IN THE MANAGEMENT OF ASSISTANTS.'

THERE is probably no part of a Head Master's work which causes him more anxiety, or calls for the exercise of greater tact, than the due management and proper control of his assistants. The difficulty arises, not so much from anything connected with the personal character of the assistants themselves, as from the peculiar and unsatisfactory position in which the Head stands in relation to his subordinates. The so-called Head does not engage his assistants—often has no voice in the business; he does not pay them, and cannot dismiss them. Moreover, the assistant observes that there are a number of people, such as members of boards, local managers, inspectors, and others, who assume, and even assert, a command over him more direct than that of the Head himself. Nay, often these people come between the subordinate and his chief, to the great lowering of the authority of the latter. Hence the nominal Head is not the real Head. Somebody else is.

There is, however, another and more important consideration which adds greatly to the difficulty of the situation. It is to be found in the nature of the work in which we are all engaged. Real educative work is absolutely impossible in any school unless the Head lives within the hearts and minds of his fellow-labourers. All must be of one soul in this business. The training of the human mind is something that cannot be commanded. You cannot, from a lofty height of authority, order one mind to educate another mind. Unless the efforts of the educator are spontaneous, they are useless. I can direct the carpenter to make the leg of a table, of a certain form and size; for the wood is inert matter, entirely passive in the hands of the workman, and can, of itself, give no sympathetic response to external operations. But all the forces and influences which are called into play in the work of developing the faculties of a sentient being are so subtle, so spiritual, that they utterly refuse to come under the control of dry authoritative commands. In this matter you cannot say to your servant 'Do this, and he doeth it.' The instant Hamlet began to command his father's spirit, it vanished.

Hence the foundation of the authority which the Head assumes over his assistant in this work of education must of necessity be the mutual respect and affection subsisting between the two. Unfortunately there are assistants whose insufferable self-conceit and boorish manners render the existence of such a foundation almost impossible. The only hope in such cases is to be found in the possibility that these young men will, as they grow older and associate more with people outside their own little circle, grow wiser.

The first type of assistant to be noted is:—

'THE FEARFULLY ENERGETIC ASSISTANT, WHO GOES INTO TEMPORARY FITS OR MANIAS ON SUBJECTS GENERALLY OUTSIDE SCHOOL-WORK PROPER.'

Such a one is usually found on the staff of every large school. He is often an admirable character, full of energy and zeal; a most useful man, exerting a charming influence over his boys, who generally love him; he is, moreover, willing to devote a large part of his private means and time to the carrying on of the particular hobby he has, for the moment, in hand. He and his class will suddenly develop an amazing zeal for dumb-bell exercise and musical drill. Everything is made subservient to this business. The boys catch up the spirit of the thing, and fully believe the main object in life is to wield rhythmetically two pieces of wood. All this is, however, only for a season. By-and-by 'flag-signalling' sets in, and the dumb-bells go below, and are packed away in the cellar. And now every boy seeks to provide himself with a flag—'a black cross or band on a white ground'—and a series of indoor and outdoor practices is arranged. We are all astounded to find that this all-important work, upon which may 'hang the safety of the nation in time of war,' has been so long shamefully neglected. All this, however, has its day, and passes away to give place to another 'much more important' affair.

The efforts of the Headmaster in his dealings with such an assistant must be directed, not to the diminution of all this flood of exuberant activity, but to the guiding of it into useful channels, and to its more constant and uniform flow.

Our next type is:—

'THE QUIET, EARNEST WORKER; CONSCIENTIOUS, INDUSTRIOUS, AND THOROUGHLY GENUINE; BUT WHO IS DULL AND HEAVY.'

This estimable young man is thoroughly trustworthy and devoted; but he takes life too seriously, is continually of solemn aspect—always *Il Penseroso*, never *L'Allegro*. He probably holds a high university degree, and yet will never become a Head Master; never, in fact, makes any application for such a post. He does not play cricket nor football; is neither a hare nor a hound, and cannot swim. He cares for none of these things; wishes only to be let alone among his books and his church-going; and the wildest stretch of imagination could not possibly reach the conception of such a one being engaged in the frivolous act of 'courtship.' In the end he will probably 'take Holy Orders,' and become a curate in some obscure village. The Head Master need trouble himself but very little about the ordinary school-work of the boys who are under the care of this assistant. They will always do well, and be a credit to the school. The weak point is, that the whole business here is much too solemn. Laughter is unknown. Nobody ever smiles. Nobody ventures upon even the thinnest of jokes. When I was a small boy, I always accompanied my father to the early prayer meetings at Little Wild Street Baptist Chapel, Drury Lane. Oh, the unutterable depression of that place! Where the gloom prevented the cobwebs from being seen! Our assistant's class-room is not quite the same as the dreary, dark vestry of Little Wild Street Strict-Baptist Chapel; yet it comes much too near the conditions of such a place. If in any

school there be a dull spot of the nature here described, then the Head must enliven it. First, let there be bright, cheerful pictures about the room. Visit the class often, and occasionally crack jokes with boys; but do not throw the lads into disorder and then leave them so—this would be most unfair to the assistant. Also, see that the school songs are of a crisp, lively character, and the recitation humorous. In short, as far as dry codes and regulations will permit, make all the surroundings of childhood as bright and happy as possible.

'THE HYPOCRITICAL SNEAK; A MANIFEST FRAUD.'

I have met this character as my schoolmate in class; as my fellow pupil teacher; as a student in college; and I have had experience of him as an assistant. As a boy he was the 'tell-tale' of his form, and sneaked himself into the good graces of a weak and short-sighted teacher. The one I knew in college was a 'leader' of the students' prayer-meetings. At a mid-summer examination we were to take geography. I had lost my map pen. Meeting Mr. H—— on the stairs leading down to our lockers, I asked him if he had a fine-pointed pen to give me. 'Yes,' said he, 'I *have* several; but why should I help *you* to pass? I want to pass myself.' And he kept his pens. If a Head Master should, unfortunately, have such a one on his staff, the only advice I can give is, get rid of him as soon as possible. His influence is altogether harmful, and he is often the secret cause of misunderstandings between you and other members of the staff, and even with some of the local managers.

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THE 1893 SCHOLARSHIP EXAMINATION.

BY DR. GEORGE BEACH, M.A.,

Co-Author of 'A Manual of our Mother Tongue,' 'A Girls' Arithmetic.' Author of 'Elements of English,' 'Entertaining Readers,' etc.

I. Day and Residential Training Colleges.

There is little doubt but that in the near future the University and the Training College will become more and more co-ordinated and connected. It would have been well if, at the commencement of the system of training teachers, foresight enough had been displayed so as to at once affiliate every Training College with a University. This step would have immensely raised the professional status of the teacher, would have put him at once upon a brotherhood with the parson (as in many Scottish parishes, where the Dominie and the Minister were once fellow-students, and now close friends), would have prevented the present almost all-pervading clerical tyranny, and would—the most important point of all—have benefited the scholars.

But it is the genius of Englishmen to blunder into success, to start badly and unpreparedly, to give odds to the enemy, and then at the last by native, dogged tenacity, to mend their ways and go in and win. Such has been the history of the training of teachers. The Education Department is now (more than twenty years after the introduction of compulsory education) beginning to see that there is no reason why a teacher during his professional training should not also achieve a University Degree. We say '*beginning to see*,' but has it been ignorance or caste prejudice that has hitherto crippled the training of teachers?

Has not the Department, like many another civil and religious despot, endeavoured to retain its subjects in comparative ignorance, lest they should conquer more liberty for themselves?

'*Quum ea ita sunt, tamen*' opportunities are now afforded to students, both at Day and Residential Training Colleges, to graduate during their curriculum.

We have been again and again asked what are the comparative merits of Day and Residential Training Colleges. In order in some measure to answer it we have obtained information from *every* college in the kingdom, besides consulting the Code and Departmental Circulars.

The chief sides on which this question should be approached are five in number—viz. (*a*) the *religious*, (*b*) the *educational*, (*c*) the *social*, (*d*) the *hygienic*, and (*e*) the *pecuniary*.

(*a*) No Day Training College imposes any *religious* test or observances. Provided that the students are of good character at entrance, and comport themselves properly during training, no further inquisition is made.

In by far the majority of Residential Colleges the student must conform to the practices and profess the dogmas of some sect or other in order to obtain admission.

Day Training Colleges are therefore more tolerant, are conducted more in accordance with the principles of religious freedom, and can devote more time to secular subjects.

(*b*) As regards *educational* facilities, the Day Training Colleges probably rank intermediately between the best London and the ordinary provincial ones.

It must not be forgotten that almost all the advantages offered by the Day Colleges are to be obtained in the foremost Residential institutions.

Students, even in the latter, who in their first year pass in any British University a preliminary or other examination, and in their second year an advanced examination approved by the Department, will not be required to present themselves in Part II. of the Certificate Syllabus, but will in December be examined in Reading, Repetition, Penmanship, School Management and Music only.

Most likely, therefore, Residential Colleges which adapt themselves to a University curriculum are to be preferred *for the present*.

(*c*) The *social* question is one that cannot be generally adjudicated upon, but requires detailed treatment. In such Day Colleges as those of Oxford and Cambridge, we unhesitatingly believe that their students will greatly benefit from the prestige attached to the '*Varsities*' with which they are connected.

We note, however, that the Department recognises *any* British University; and it is certain also that many, if not all, of the minor ones will endeavour to attract students by establishing Day Training Colleges, especially as the accommodation in Residential Colleges is so meagre.

It would be invidious, and perhaps dangerous, to mention those Universities to be avoided; but there assuredly are some, respecting which we say, '*Go not after them*.'

(*a*) *Hygienic* considerations are of primary import-

ance, and here the Residential College student will have the advantage. He must, perforce, lead a more regular life; his hours of sleep, for meals, for study, and of exercise are fixed for him. He is under stricter discipline and *subject to fewer temptations*.

Many a fine, stalwart fellow has left the University with a broken-down constitution; and numerous creatures, weaklings upon entrance, have departed from Training Colleges established in health.

Many of the above considerations apply with peculiar force to women, who, when there are no 'Lords of Creation' to cater for, often content themselves with what Dr. Johnson called 'kettle-slops' and bread and butter, instead of providing more nutritious and tempting food.

(*e*) The *pecuniary* comparison requires much care, and is much complicated by the different terms exacted by the divers colleges. A general conclusion is therefore rather broad, and particular ones are obviated by considerations of space. There is, however, little to be regretted herein, because, where possible, money should not enter into the question where education is concerned, and the error in any individual case will not exceed a few pounds per annum.

Every man, a Queen's Scholar in a Day College, will receive annually £25, and every woman £20. But the entrance fees exacted will not leave *on the average* more than a margin of £5 for subsistence, etc., which they have to provide for themselves.

On the other hand the *average* entrance fee at a Residential College is at least £15, and the students receive no subsidy, but are maintained free of cost.

Broadly speaking, then, the Day Student is £20 better off in cash, but has to provide his own board and apartments, etc.

The balance, therefore, with some hesitation, must be struck in favour of the Residential College, as far as expense is concerned.

We must, however, decline the responsibility of further 'summing up,' for so many items, attaching to each particular instance, would have to be weighed, that generalisation would most likely be misleading; and as we have somewhat fully stated the details of the problem, it will now be better worked out in the individual cases by the individuals themselves.

II. Notes on History.

(*a*) Have two special books only—a general history and a date book. No better can now be selected than *Boyd-Carpenter and Green's* 'Outlines of British History' accompanied by *Green's* 'Main Facts and Dates of British History.' These manuals are not only up to date, well compiled, in the groove of moderate dimensions and of uniform excellence, but *they are companion books* and mutually assist one another.

(*b*) Larger histories should only be used for reference, not for ordinary study. In the multitude of details and study-books is confusion—an ill-arranged and badly-digested conglomeration of facts.

Neither will note-books be much if at all required, but interlineation and marginal remarks may be freely used.

(*c*) History should be studied with the facts arranged both contemporaneously and in temporal sequence. Otherwise it cannot properly be understood. The student should be able, for instance, to give a continuous sketch in chronological order of 'The Hundred Years' War' for the possession of France, and also of our struggles with Scotland during that period. Nevertheless, he will not intelligently understand these contests unless he is aware of the parallelism of events and the relationship between the two. *Again*, the emancipation of the labourer, the progress of Wiclif's doctrines, and the uprising of various pretenders to the Crown must all be treated both separately and in combination.

(*d*) In writing out genealogies give dates, omit unnecessary individuals, insert double descents where possible, and bring out important names in prominent characters.

(*e*) The following is the present (and fourth) Cabinet of Mr. Gladstone:—

	Name.	Office.
1	William Ewart Gladstone ..	Premier, First Lord of Treasury, and Lord Privy Seal.
2	Lord Herschell	Lord High Chancellor.
3	Earl of Kimberley	Lord President of Council, Secretary of State for India.
4	Sir William Vernon-Harcourt	Chancellor of the Exchequer.
5	Herbert Henry Asquith, Q.C.	Secretary of State for Home Department.
6	Earl of Rosebery	Secretary for Foreign Department.
7	Marquis of Ripon	Secretary of State for Colonial Department.
8	Henry Campbell-Bannerman	Secretary of State for War Department.
9	Sir George Otto Trevelyan, Bart.	Secretary for Scotland.
10	Earl Spencer	First Lord of the Admiralty.
11	John Morley	Chief Secretary for Ireland.
12	Anthony John Mundella ..	President of Board of Trade.
13	Arnold Morley	Postmaster-General.
14	Henry Hartley Fowler ..	President of Local Government Board.
15	James Bryce	Chancellor of Duchy of Lancaster.
16	George John Shaw-Lefevre	First Commissioner of Works.
17	Arthur Herbert Dyke Acland	Vice-President of Committee of Council.

(*f*) *Sketch of Events from November, 1891, to December, 1892*:—

December, 1891.—Census of Bengal, population, 74,610,000; riots at Waterford; fighting in Burmah; explosion at Dublin Castle.

January, 1892.—Salvation Army disturbances at Eastbourne; death of Khedive of Egypt; Mr. Spurgeon and Cardinal Manning died.

February.—New French tariff; Zanzibar declared a free port; Commons refused to consider Welsh Disestablishment.

March.—£20,000 voted for Mombasa Railway; great fire at Mandalay; tobacco duties for half-year reached £10,136,000.

April.—Woman's Suffrage Bill rejected; terrible hurricane at Mauritius; destructive cyclone in Queensland; National Surplus for year, £1,067,000.

May.—Political Mission to Morocco; Members of Parliament acquitted for refusing to present a petition.

June.—Gilbert Islands annexed; Unionist Convention at Dublin; Dissolution of Her Majesty's Twelfth Parliament.

July.—Terrible fire at St. John's, Newfoundland; failure of Morocco Mission; General Election, Home Rule Majority, 40; Tercentenary of Trinity College, Dublin.

August.—Mr. Gladstone accepted office; visit of German Emperor.

September.—Railway opened from Jaffa to Jerusalem; cholera epidemic at Hamburg.

October.—Death of Lord Tennyson; Lord Rosebery pronounced against withdrawal from Uganda.

November.—Strike of 45,000 Lancashire Cotton Operatives; South Meath Election invalidated owing to sacerdotal intimidation.

III.—Model Arrangement of Simultaneous Equations :—

Solve the equations— $\left.\begin{aligned} \frac{1}{x} + \frac{1}{y} &= \frac{5}{6} \\ \frac{1}{x^2} + \frac{1}{y^2} &= \frac{13}{36} \end{aligned}\right\}$

No. of Equation.	Source of Equation.	Working.
I.	Hypothesis	$\frac{1}{x} + \frac{1}{y} = \frac{5}{6}$
II.	Hypothesis	$\frac{1}{x^2} + \frac{1}{y^2} = \frac{13}{36}$
III.	Squaring I.	$\frac{1}{x^2} + \frac{2}{xy} + \frac{1}{y^2} = \frac{25}{36}$
IV.	Subtracting II. from III. ..	$\frac{2}{xy} = \frac{12}{36} \therefore \frac{4}{xy} = \frac{24}{36}$
V.	Subtracting IV. from III. ..	$\frac{1}{x^2} - \frac{2}{xy} + \frac{1}{y^2} = \frac{1}{36}$
VI.	Extracting Square Root of V.	$\frac{1}{x} - \frac{1}{y} = (a) + \frac{1}{6}$; $(b) - \frac{1}{6}$
VII.	I. + VI. (*a*)	$\frac{2}{x} = 1$ or $\frac{1}{3}$; $\therefore x = 2$ or 3
VIII.	Substituting value of x in I.	$\frac{1}{2} + \frac{1}{y} = \frac{5}{6}$; $\frac{1}{y} = \frac{1}{3}$; $\therefore y = 3$, etc.

IV. Our Lady Pupils should procure 'Practical School Needlework,' by Miss J. Warren (Inspectress of Infant Schools to the Leicester School Board) and just published by Messrs. Joseph Hughes and Co. (Price 2s. 6d.) It contains numerous *large* patterns and diagrams, and answers every question likely to be set respecting the teaching of needlework in elementary schools.

V. Requested Solutions.

(*a*) We are always pleased if in any way we can oblige our numerous correspondents by complying with their suggestions, but generally our space will not permit the insertion of solutions to problems that are not of general interest.

(*b*) It is between two and three o'clock, but a person looking at his watch mistakes the hour and the minute hand, so that he thinks the time of day fifty-five minutes earlier than the reality. What is the actual time?

He thinks it to be an hour earlier and five minutes later. There must, therefore, be five minute spaces between the hands. Now at two o'clock there were ten minute spaces intervening, so that the minute hand has gained five minutes upon the hour hand since two o'clock.

The problem now is :—

'How long will it take the minute hand to gain five minutes upon the hour hand?' And as the minute hand gains fifty-five minutes in an hour, the answer will be $\frac{1}{11}$ hrs., or $5\frac{5}{11}$ mins. past two.

(*c*) Write down the smallest fraction which, when reduced to a decimal, will give three non-recurring figures with a possible 60 figures, and not more than 60 recurring.

This subject was exhaustively treated of in the last December issue, pp. 310 and 311. For the fraction to be smallest possible, the three non-recurring figures must be three noughts, and there cannot be 60 recurring figures without the denominator being 61. Therefore, the total denominator will be 61,000, and of course the smallest fraction will be $\frac{1}{61000}$. Answer.

VI. 'The Infants' Mistress.'

All our readers have, we hope, received a copy of the above newly-launched paper. It directly affords considerable scholarship help, and is replete with interesting and instructive information. The subscription for the full year is only 6s. 6d., and, in addition, certain standard works varying in value from 2s. 6d. to 4s. 6d. will be forwarded to *immediate* subscribers, who send their remittances direct to the Publishers, Messrs. Joseph Hughes and Co., Pilgrim Street, Ludgate Hill, London, E.C.

SELECTED SCHOLARSHIP QUESTIONS.

Week Ending 4th February, 1893.

1. Mention some instances of personification. How far is this principle subject to rule? What are Metonomy, Apostrophe, and Metaphor?

2. Why is it wrong to call *what* a Compound Relative? Give instances of the different uses of *what*.

3. Draw a map of the southern and eastern coasts of the United States.

4. Describe the formation of a delta, and explain the periodical rise of the Nile.

5. Give the chief features and events of the reign of Athelstan.

6. Write a short account of the changes in the Constitution under the Plantaganets.

7. How were faults of unpunctuality, sullenness, quarrelling, and falsehood punished in the School from which you come?

8. Classify the subjects taught in your school, according to the Code nomenclature.

9. Write under each of the following notes its pitch name:—

(*Tonic Sol-fa.*) What are the names of Doh sharp, Fah sharp, Ray sharp, Ray flat, Te flat, and Me flat?

10. Find the difference between the average length of the month in the first and second halves of 1880. Ans. 8 hours.

11. (*Men only.*) In the centre of a room 21 feet square, there is a square Turkey carpet, the rest of the floor being covered with oil-cloth. The carpet and oil-cloth respectively cost 16s. 6d. and 8s. 6d. per sq. yard, and the whole cost is £35 4s. 6d. Find the width of the oil-cloth border. Ans. 1 ft. 6 in.

(*Women only.*) Find the Discount on £929 10s. due in 2¼ years at 2½ per cent. Ans. £49 10s.

12. (*Men only.*) Explain the terms definition, axiom, postulate, problem, theorem, enunciation, hypothesis. Write out Euclid I. 4.

(*Women only.*) Describe the duties of an under nursemaid, and show in what way these duties differ from those of a maid of all work.

13. (*Men only.*) Write out Euclid II. 1.

Define gnomon, rectangle, and segment. What is meant by a line being divided externally?

(*Women only.*) Describe in a letter to a Pupil Teacher the advantages of the system carried out in the Post Office Savings Bank.

14. (*Men only.*) The area of a chess-board, which contains 64 equal squares and an outer rim an inch wide, is 134·56 square inches. Find the side of each square, and also the width of the outer rim of another board of equal area, whose smaller squares each contain 1·361 sq. ins. Ans. 1·2 and 1·1⅔ ins.

SCHOLARSHIP OR FOURTH YEAR ROUTINE FOR **FEBRUARY**, 1893. (MEN AND WOMEN.)

DAYS	FIRST WEEK.			SECOND WEEK.			THIRD WEEK.			FOURTH WEEK.		
	I.	II.	III.	I.	II.	III.	I.	II.	III.	I.	II.	III.
MONDAY	H.C.F. & L.C.M. of Algebra Questions on Needlework	History from 1848 to 1857	Chapters 40 to 44 of 'De Bello Gallico,' *or* Remainder of 'La Jeune Sibérienne'	Simultaneous Equations of the First Degree. Ingredients of Food	Dates from 1848 to 1867	Latin, *or* French Grammar	Quadratic Equations. Rules of Health	England under the Stuarts	Chapters 45 to 50 of 'De Bello Gallico,' *or* Pages 5 to 14 of 'La Jeune Sibérienne'	Problems involving Quadratic Equations. Any Revision.	Lives of Great Men	Latin, *or* French Grammar
TUESDAY	Props. 1 to 7 of Euclid, Book II. Knitting	Revise Geography of Asia	Science, *or* Revision	Props. 7 to 14 of Euclid, Book II. Patterns of Boy's Shirt and Woman's Nightgown	Geography of Polynesia	Science, *or* Revision	Props. 1 to 7 of Euclid, Book II. Patches	Latitude and Longitude	Science *or* Revision	Props. 27 to 48 of Euclid, Book I., *or* Patches	Winds and Currents	Science, *or* Revision
WEDNESDAY	Stocks	Repetition and Literature	Drawing, *or* Revision	Division into Proportional Parts	Music	Drawing, *or* Revision	Compound Interest	English Composition	Drawing, *or* Revision	Miscellaneous Arithmetic	Repetition and Literature	Drawing, *or* Science
THURSDAY	Simultaneous Equations of the First Degree	History from 1867 to 1891	Latin, *or* French Grammar	Problems leading to Simultaneous Equations of the First Degree	England under the Tudors	Notes of a Lesson on Writing to Standard II.	Quadratic Equations	England under the Stuarts	Latin, *or* French Grammar	Problems involving Quadratic Equations. Any Revision	Lives of Great Men	Remainder of 'De Bello Gallico,' *or* Pages 14 to 22 of 'La Jeune Sibérienne'
FRIDAY	Definitions, Axioms, Postulates of Books I. and II. Euclid. Calico Sampler	How to teach Reading to Standard I.	Science, *or* Revision	Props. 33 to 48 of Euclid, Book I. Flannel Sampler	Map of United States	Science, *or* Revision	Props. 1 to 26 of Euclid, Book I. Diagram of Chemise	Physical Geography of Mountains and Rivers	Music	Any Book I. Deductions. Diagram of Night Shirt	Map of Australia	Science, *or* Drawing
SATURDAY	Present Worth and Discount	Parsing and Analysis	Examination	Mensuration of Parallelograms, Problems of Motion	Greek Prefixes and Affixes.	Examination	Mensuration of Triangles. Simple Interest	Notes of an Object Lesson	Examination	Mensuration of Irregular Figures. Compound Practice	Music	Examination

(*Women only.*) By what methods can the work be shortened in a proportion sum? Explain why.

15. Prove that the difference between the cube of the sum of any two numbers and the sum of their cubes is divisible by three times their product.

16. Find the square root of $4x^4 + 12x^3y + 5x^2y^2 - 6xy^3 + y^4$.
Ans. $2x^2 + 3xy - y^2$.

WEEK ENDING 11TH FEBRUARY, 1893.

1. Write a short essay upon '*Constant droppings wear away stone.*'

2. *All* Nature is *but Art unknown* to thee;
All Chance, *Direction which* thou canst not *see*.
All Discord, Harmony not *understood*,
All partial *Evil*, universal Good;
And, *spite* of Pride, in erring Reason's spite,
One truth is *clear*, '*Whatever is, is* right.'—*Pope.*
Analyse the above lines and parse the italicised words.

3. What is the relation between Longitude and Time? Explain a method of determining Longitude.

4. What animals are peculiar to Australia? Enumerate the Australian districts rich in minerals.

5. Give proofs of the vigour of Cromwell's policy both at home and abroad.

6. Describe the struggles with the Danes in the reign of Ethelred II., and the treaty with Knut in the following reign.

7. What are the chief faults to be expected in the reading of poetry in the Fifth Standard?

8. Give instances showing the difficulty of teaching correct spelling, from the different ways in which the same sound is represented.

9. Distribute the following into bars of common tune:—

OR

(*Tonic Sol-fa.*) How do the relations between the 3rd and 4th tones, and between the 7th and 8th differ from those between any other two consecutive tones?

10. Explain how to divide one fraction by another. In how many ways may Vulgar Fractions be regarded?

11. Find the value of the series $\frac{1}{2} + \frac{1}{2 \times 3} + \frac{1}{2 \times 3 \times 4}$ . . . . . accurate to seven places of decimals.
Ans. ·7182818.

12. (*Men only.*) Write out Euclid I. 7.

Show out to trisect a given straight line.

(*Women only.*) State briefly the cost, the time required, and the method of cooking three of the following:—A mackerel, a poached egg, a potato pie, a rice pudding, a mutton chop, a rasher of bacon.

13. (*Men only.*) Write out Euclid II. 2.

Divide a given straight line into two parts, so that the rectangle shall be equal to a given square.

(*Women only.*) In what way have you been taught to relieve any of the school children suffering from the following causes:—A burn, a bruise, a severe cut, an attack of fainting, bleeding at the nose, chilblains?

14. (*Men only.*) Find the diagonal of a square that shall be equal in area to a rectangle of which two adjacent sides are 30 and 20.
Ans. 34·64.

(*Women only.*) The planting of a rood of ground cost £28 8s. 4d.; what was paid for planting 23 acres, 3 roods, 24 perches, 11 sq. yds.?
Ans. £2,716 17s. 10d.

15. Multiply $1 - x^2 + x^4 - x^6$ by $1 + x^2$. Ans. $1 - x^8$.

16. A farmer has a number of hurdles 6 ft. long. He finds that by arranging them so as to enclose a given space of ground, if he place them one foot distant from each other, he has not enough by 80; but if he place them a yard apart, he has 50 hurdles to spare. How many hurdles has he? Ans. 505.

WEEK ENDING 18TH FEBRUARY, 1893.

1. What varieties of antecedent may the Relative Pronoun possess?

2. Paraphrase—
'For whereso'er I turn my ravished eyes,
Gay gilded scenes in shining prospect rise;
Poetic fields encompass me around,
And still I seem to tread on classic ground;
For here the muse so oft her harp has strung,
That not a mountain rears its head unsung;
Renowned in verse each shady thicket grows,
And every stream in heavenly numbers flows.'
—*Addison.*

3. Draw a map of France.

4. Where and what are Elephanta, Irawaddy, Khyber, Andaman, Kandy, Runn of Cutch, and the Black Hole?

5. On what occasions did elective prevail over hereditary right in the selection of English sovereigns?

6. Who were the wives of Henry I., George IV., Edward I., Henry VII., and Henry V.? For what were they distinguished?

7. Write Notes of a first lesson on Composition to Standard V.

8. What is the best method of preparing the children who have to pass in writing in Standard I.?

9. What places in the major diatonic scale do the semitones occupy? OR,

(*Tonic Sol-fa.*) Which are the emphasised notes in a measure of four-pulse time? Which in three-pulse?

10. What sum of money must be invested in the 5½ per cent. stock at 83 to enable the possessor to realise a nett income of £64½ per calendar month, after paying 1s. in the £ income-tax? Neglect brokerage. Ans. £12,231$\frac{3}{11}$.

11. (*Men only.*) Divide £1,050 into four parts, such that the respective interests on the 1st at 2½ p.c. for 4 months, on the 2nd at 3 p.c. for 4 months, on the 3rd at 4 p.c. for 5 months, and on the 4th at 5 p.c. for 6 months may be equal.
Ans. £393 15s.; £328 2s. 6d.; £196 17s. 6d.; £131 5s.

(*Women only.*) Express as a Vulgar Fraction and also as a decimal, the difference between $25{\cdot}135 \times 13\frac{7}{11}$ and $61{\cdot}375 \times 5\frac{4}{11}$.
Ans. $\frac{3}{4}\frac{3}{4}$; ·675.

12. (*Men only.*) Write out Euclid I. 10.

If two opposite sides of a parallelogram be bisected, and two lines be drawn from the points of bisection to the opposite angles, these two lines shall trisect the diagonal.

(*Women only.*) What amount of coloured print is required for a child's frock (age of girl, 12 years)? Mention any other material, with the cost and quantity required to complete a dress.

13. (*Men only.*) Write out Euclid II. 3.

The square on the excess of one straight line above another is less the squares on the two lines by twice their rectangle.

(*Women only.*) State the industrial work which devolves on a girl day by day who has charge of her own bedroom, the time such work should occupy, and the method she should adopt.

14. (*Men only.*) From two of the opposite angles of a parallelogram whose sides are 75 and 120, perpendiculars can be dropped such that the two triangles so formed are together equal to the remainder of the parallelogram. Find its altitude. Ans. 45.

(*Women only.*) What fraction of £11 7s. 6d. is equivalent to $\frac{3}{4}\frac{1}{0}$ of 15s. 6d.? Ans. $1\frac{13}{310}$.

15. Find the value of $\sqrt{a^2b^2} + \sqrt[3]{a^3b^3} + \sqrt[6]{a^2b^2}$ when $a = 5$ and $b = 25$. Ans. 755.

16. A goods train travels at the rate of eight miles an hour on a railway. At the end of 12 hours it meets a passenger train travelling in the opposite direction, which arrives at the original starting station 16 hours after the goods train left. What was the rate per hour of the passenger train? Ans. 24 miles per hour.

WEEK ENDING 25TH FEBRUARY, 1893.

1. Paraphrase—
'The unsightly plain
Lies a brown *deluge, as* the low bent *clouds*
Pour flood on flood, *yet unexhausted still*
Combine, and *deepening* into night, shut *up*
The *day's* fair face. The wanderers of Heaven
Each to his home retire; *save those that* love
To take their pastime in the troubled air,
Or skimming flutter round the dimply pool.'
—*James Thomson.*

2. Analyse the above and parse the italicised words.

3. Prove that the length of a degree of latitude is the distance

which it is necessary to travel in a north and south line to produce a difference of 1° in the altitude of the celestial pole.

4. How did we obtain Zanzibar and of what advantage is that possession to England?

5. What are the present prerogatives of the English sovereign?

6. What do you know of the Cato Street Con piracy, Letters of Junius, Porteous Riots, Darien Scheme, Declaration of Breda, and the Commission of Assay? Give dates.

7. In what respects is Arithmetic one of the most useful means of mental discipline?

8. What subjects are best suited for collective teaching? In what subjects is it injurious?

9. Write the scales of F and G, placing the essential sharp or flat before any note requiring it; OR

(*Tonic Sol-fa.*) Write out any tune, giving name, with which you are acquainted'

10. If 9 men *or* 16 women could do a piece of work in 144 days in what time would 7 men and 9 women do it, working together?
Ans. $107\frac{85}{193}$ days.

11. (*Men only.*) A can beat B by 5 yards in 100, and B can beat C by 10 yards in 200. By how much can A beat C in a 400 yards race? Ans. 39 yards.

(*Women only.*) Simplify—

$$3 - \frac{1}{2 - \frac{1}{6 + \frac{1}{4}}} \div 1 + \frac{1}{4 + \frac{1}{3 - \frac{1}{3 + \frac{1}{2}}}}$$
Ans. $1\frac{2203}{4004}$.

12. (*Men only.*) Write out Euclid I. 13.

Draw through a given point, between two straight lines not parallel, a straight line which shall be bisected at that point.

(*Women only.*) Give reasons why an Elementary Teacher should of necessity lay by some sum of money year by year; mention any safe investments for such savings.

13. (*Men only.*) Write out Euclid II. 4.

In any triangle the squares on the two sides are together double the sum of the squares on the median and half the base.

(*Women only.*) What are the special purposes accomplished by food?

14. (*Men only.*) Find the acreage of a field which has two sides parallel and its other two sides equal to one another, the parallel sides being respectively 370 and 250 links, and the other two sides each 100 links long. Ans. ·248 acres.

(*Women only.*) A man spends ½ of his money, then ⅓ of the remainder, then ¼ of what was still left. He finally has £25 in hand. How much had he at first? Ans. £100.

15. Prove the formula $a^m \times a^n = a^{m+n}$.

Multiply $x^3 - x^2y - 2y^3$ by $x^3 + x^2y - 2y^3$.
Ans. $x^6 - x^4y^2 - 4x^3y^3 + 4y^6$.

16. A and B start to run a race. At the end of 5 minutes when A has run 900 yards and has outstripped B by 75 yards he falls; but though he loses ground by the accident, and for the rest of the course makes 20 yards less than before, he comes in only ½ minute behind B. How long did the race last? Ans. 36 mins.

—o—

LONDON MATRICULATION.

JUNE, 1893.

OUR PREPARATION CLASS FOR PRIVATE STUDENTS.

BY T. RUSSELL MALTBY, M.A.
Kingswood School, Bath.

(FIRST MONTH.)

THE next examination will commence on Monday, the 12th of June. Candidates will be examined in *six* subjects, and will not be approved by the examiners unless they have shown a competent knowledge *in each of the six.* It has already been pointed out in these colums that, although our course is completed in six months, candidates of average attainments require a full year's direct preparation for the London examination. We hope, therefore, that the majority of our present class have been hard at work for six months or more, and are now so far familiar with their subjects as to be able to keep pace with the demands which we must make upon their reading and scholarship in our next five issues. The best plan of study is to carry forward one's work in six parallel columns, care being taken not to dissipate energy by too frequently changing the subject. Why not, for a general plan, follow a scheme like this?—Give the best working-day of the week to *Latin*, the next best to the *second language and Arithmetic*, the third to *English*, the fourth to *Algebra and Geometry*, the fifth to *Mechanics*, the sixth to *Science*; and there are many arguments for resting from examination work on the seventh day.

Candidates should know by this time what is their 'weak subject,' and from the first lay an emphasis of attention upon that point. General lines of study are clearly laid down in the University Regulations, which should be repeatedly referred to, but clearer guidance can be obtained from the London papers of the last three or four years. Nothing else can give the student a correct impression of the scope and character of the examination, and, we may add, nothing but writing formal answers to recent questions can give candidates a proper estimate of their preparedness for the examination.

The six subjects *in each of which* competent knowledge must be shown are—

I. *Latin* (two papers of two hours each).

II. *One** of the following languages:—*Greek, French, German, Sanskrit, Arabic* (one three-hours' paper).

III. *The English Language* and *English History with the Geography relating thereto* (two three-hours' papers).

IV. *Mathematics* (two three-hours' papers).

V. *Mechanics* (one three-hours' paper).

VI. *One*† of the following branches of Science:—*Chemistry, Heat and Light, Magnetism and Electricity, Botany* (one three-hours' paper).

Requirements for June, 1893.

I. LATIN.

The first paper will contain:—
(i.) Passages for translation from *Cicero, de Senectute*, and *pro Archia*.
(ii.) Questions arising out of these books.
(iii.) Short and easy passages (prose or verse) for translation at sight.

The second paper will contain—
(i.) Questions in Latin Grammar.
(ii.) 'Simple and easy' sentences of English to be translated into Latin. *Special stress is laid upon this part of the examination.*

II. GREEK.

The paper will contain:—
(i.) Passages for translation from *Xenophon, Anabasis I.*
(ii.) Questions arising out of this book.
(iii.) General questions in Grammar.
(iv.) Short and easy passages for translation at sight.
Special stress is laid upon Greek Grammar.

II. FRENCH.

The paper will contain (1) Passages for translation (at sight) into English. (2) Questions in Grammar, limited to the Accidence.

III. ENGLISH.

One paper will contain questions on the General History and Grammatical structure of the English language. The second will be on the History of England to the end of the Seventeenth Century, with the Geography relating thereto. *N.B. Special stress is laid on correct Spelling and Grammar.*

* In these columns *two* of these languages will be dealt with—viz., *Greek* and *French*. Our readers will understand that they are alternative, and that only *one* of the above languages is to be taken up by each candidate.

† We shall deal with *two* of these Branches—viz., *Chemistry* and *Heat and Light*; but only *one* branch is to be taken up by each candidate.

IV. MATHEMATICS.

First paper: Ordinary Rules and Processes of *Arithmetic*, *Algebra* to Quadratic Equations.

Second Paper: *Geometry*—the subjects of the First Four Books of Euclid, and simple deductions.

V. MECHANICS.

The regulations under this heading should be well studied. They include *Hydrostatics*. Candidates will be expected to show a general acquaintance with the *apparatus* by which the elementary principles of Physics can be illustrated and applied; in fact, our readers must arrange for a few lessons, at least, in a physical laboratory.

VI. OTHER SCIENCES.

Here, too, the regulations are somewhat detailed, and should be carefully observed. Some *practical* acquaintance with the subject chosen is essential.

TEXT BOOKS.

The following will be required by those who wish to follow our course:—

1. *Allen's Elementary Latin Grammar.* (Clar. Press, 2s. 6d.)
2. *Allcroft and Haydon's Latin Composition and Syntax.* (Clive and Co., 2s. 6d.)
3. *Latin Reader*, by H. J. Hardy. (Macmillan, 2s. 6d.)
4. *Cicero: de Senectute*, by J. S. Reid. (Pitt Press, 3s. 6d.)
5. *Cicero: pro Archia*, by J. S. Reid. (Pitt Press, 2s.)
6. A good Latin Dictionary.

7. *Abbott and Mansfield's Greek Grammar.*
8. *Stories and Legends*, by F. H. Colson. (Macmillan, 2s. 6d.)
9. *Xenophon: Anabasis I.*, by A. S. Walpole. (Macmillan, 1s. 6d.)
10. A good Greek Lexicon.

7. *Breymann's French Grammar.* (Macmillan, 4s. 6d.)
8. *Anecdotes Historiques et Littéraires*, by V. Kastner. (Hachette, 2s.)
9. Other material for translation from French.
10. A good French Dictionary.

11. *Mason's English Grammar.* (Bell, 3s. 6d.)
12. *Hewitt and Beach's Manual of our Mother Tongue.* (Allen, 7s. 6d.)
13. *Outlines of British History*, by H. Boyd-Carpenter and E. E. Green, M.A.. (Joseph Hughes and Co., 2s. 6d.)
14. *Hall and Knight's Algebra.* (Macmillan, 4s. 6d.)
15. *Hall and Stevens' Euclid.* (Macmillan, 3s. or 4s. 6d.)
16. *Wormell's Mechanics.*
17. *Kemshead's Chemistry.* (Collins, 2s.), or *Stewart's Heat and Light.* (Clive & Co., 3s. 6d.)

FURTHER APPARATUS.

Candidates will find need of further assistance in one subject or another in the course of their reading, and we recommend the following:—

A Classical Dictionary.
A Classical Atlas.
Allen's Second Exercise Book (Latin).
Macmillan's French Course (Third Year).
Outlines of English History, especially *Acland and Ransome's Shorter Outlines.*
A Historical Atlas.
Magnus's Mechanics.
Worked Examples in Mechanics. (Clive & Co., 1s. 6d.)
Synopsis of Non-Metallic Chemistry. (Clive & Co., 1s. 6d.)
Lecture on Light, by Wormell.
Lecture on Heat, by Wormell.
Heat and Light Problems, by Stewart. (Clive & Co., 1s. 6d.)

There is also the question of 'Keys.' If translations of the Latin and Greek authors must be used, they should be respectable pieces of work. Many candidates will avoid waste of time by getting the key to Allcroft & Haydon's book, but it should be carefully and even reluctantly used.

A good Dictionary, for general purposes, should be always at hand. If it is large and cyclopædic, so much the better; but a smaller one, such as 'Blackie's' (7s. 6d.), or 'Cassell's,' may be made a valuable adjunct to all kinds of reading.

Copies of the Regulations may be had from the Registrar, (Burlington Gardens, W.), and old Matriculation papers may be procured most conveniently from Clive & Co.

Finally, there are the student's *note-books*. We trust that all our readers are skilled makers of notes. Note-making is an art, and it should be cultivated. Other things being equal, when the last month comes, the man with good notes will easily draw to the front. Rules cannot be given for the making of good notes; everyone should make his own manner of notes, but all notes should be compact, clear, striking. They should be more suggestive than expository, full of the shorthand of the individual, gesticulations rather than coherent statements, reduced surveys rather than landscapes. In our opinion, marginal marks in the text-books and notes may be made most valuable aids to study.

Course of Work for February.

I. LATIN.

1. *Allen's Grammar, Sects. 1-85.* Revision of nouns, adjectives, pronouns, verbs, particles. Mark in the margin all points not well known before.
2. *Allcroft and Haydon, Sects. 1-79.* Learn the examples.
3. *Allcroft and Haydon, Exercises I., II., III.* 15 sentences from the A's, 10 from the B's, 5 from the C's. Candidates have to learn to turn sentences of this sort without aid.
4. *Cicero: de Senectute, Introduction and Sects. 1-38.* Make a written translation, leaving space for correction and improvement.

II. GREEK.

1. *Abbott and Mansfield's Grammar, Sects. 32-100* Revision of nouns and adjectives. Mark the margin.
2. *Xenophon: Anabasis I., Introduction and Chapters I. and II.* It would be well to read Grote's chapters on this history before beginning the translation. Attend to the map. Make a written translation.

III. FRENCH.

1. *Breymann's Grammar, to the end of weak verbs.* These verbs must be known, and scarcely a word on these pages may be omitted.
2. *Translation.* Read large quantities of French prose, and note words not known to you. For the present we prescribe no written work.
3. *Word-lists.* The chief difficulty in translating is the vocabulary. These word-lists should be lengthy, gathered from all your reading, and periodically 'committed.'

IV. ENGLISH.

1. *Mason, Historical Outline.*
2. *Hewitt and Beach, pp. 457-562*, omitting pp. 499-513, 532-546, 555-562. Long lists of words need not be learnt.
3. *Mason, Introduction, Alphabet, Accent.*
4. *H. and B., pp. 563-594.* The alphabet is important. Base your work on Mason.
5. *Ransome's History to 1066, with the Geography relating thereto.* The early history is particularly important. Make maps.

V. MATHEMATICS.

1. *Arithmetic.* Practice in answering London questions.
2. *Hall and Knight's Algebra, Chapter I.-VIII.* Pay attention to all theoretical proofs, and in your exercises cultivate *style.*
3. *Hall and Stevens's Euclid.* Revise Book I. and work occasional exercises, making a note or two of the method of each solution.

VI. MECHANICS.

Wormell, Introduction and Chapters I.-V. Be ready with a proof of each formula.

VII. CHEMISTRY.

Kemshead, Chapters I., II., VII. (Hydrogen), *VIII.* (Chlorine), *IX.* (Hydrochloric acid). This is a course for those who have already read the book. Work out numerous calculations and *see experiments.*

VIII. HEAT AND LIGHT.

Stewart, Chapters I.-V. with calculations.

SUMMER SCENES.

Adapted from WEBER, *by* T. CRAMPTON.

f Allegretto.

TREBLE. ALTO.

1. Will you come where the wild bee is hum-ming 'Mid the blossoms and wild flow'rs so gay? 'Tis her song that the sum-mer is
2. Will you come where the sun gilds the morn-ing With the love - li - est tints of the rose, All the hills and the val - leys a -

TENOR. BASS.

Key G. *f Allegretto.*

S. .m ,m | m ,m ,m :m ,m ,m | s :m ,m ,m | r .r ,r :r .s ,f | m : .m ,m | m .m ,m :m .s ,s
A. .d ,d | d .d ,d :d .d ,d | m :d .d ,d | t_1 .t_1 ,t_1 :t_1 .t_1 ,t_1 | d : .d ,d | d .d ,d :d .d ,d

1. Will you | come where the wild bee is | humming 'Mid the | blossoms and wild flow'rs so | gay? | 'Tis her | song that the sum-mer is
2. Will you | come where the sun gilds the | morn-ing With the | love - li - est tints of the | rose, | All the | hills and the val - leys a -

T. .s ,s | s .s ,s :s .s ,s | s :s .s ,s | s .s ,s :s .s ,s | s : .s ,s | s .s ,s :s .s ,s
B. .d ,d | d .d ,d :d .d ,d | d :d .d ,d | s_1 .s_1 ,s_1 :s_1 .s_1 ,s_1 | d : .d ,d | d .d ,d :d .m_1 ,m_1

com - ing, 'Tis her con-stant and beau-ti-ful lay! Will you come to the woodland and mountain, Where the flocks feed in meadows so
dorn - ing, While in radiance and splendour it glows? Will you come when the daylight, ad-van-cing, Call-eth man to his la-bour and

f D.t.

l :f .f ,m | r .r ,r :s .t_1 ,r | d : .^{s_1}d ,d | d ,m .m ,s :s ,d' .d' ,m' | m' :d' .d' ,d' | m' ,r' .d' ,t :l ,s .l ,t
d :d .t_1 ,d | s_1 .s_1 ,s_1 :s_1 .f_1 ,f_1 | m_1 : .^{s_1}l .d | d .d ,m :m .m ,s | s :s .s .s | f .f ,f :f .f ,f

com - ing, 'Tis her | con-stant and beau-ti-ful | lay! Will you | come to the woodland and | mountain, Where the | flocks feed in meadows so
dorn - ing, While in | radiance and splendour it | glows? Will you | come when the daylight, ad- | van - cing, Calleth | man to his la - bour and

f :l .r ,d | t_1 .t_1 ,t_1 :t_1 .r ,t_1 | d : .^{s_1}d ,d | d .s ,s :s .s ,s | s :s .s ,s | s .s ,s :s .s ,s
f_1 :f_1 .f_1 ,f_1 | s_1 .s_1 ,s_1 :s_1 .s_1 ,s_1 | d : .^{s_1}d ,d | d .d ,d :d .d ,d | d :m .m ,m | s .s ,s :s_1 .s_1 ,s_1

f *p*

green, Where they sip from the clear crystal foun - tain, As it spar-kles in bright summer sheen? Will you come where the brook gently
toil, Ev - 'ry plea-sure its val - ue en - han - cing, As we ga-ther our wealth from the soil? Will you come when the sha-dow of

f f.G. *p*

d' : .d ,d | d ,m .m ,s :s ,d' .d' ,m' | m' :d' .d' ,d' | m' ,r' .d' ,t :l ,s .l ,t | d' : .^{l}m ,m | m .m ,m :m .m ,m
m : .d ,d | d .d ,m :m .m ,s | s :s .s ,s | f .f ,f :f .f ,f | m : .^{f}d ,d | d .d ,d :d .d ,d

green, Where they | sip from the clear crys-tal | foun - tain, As it | sparkles in bright summer | sheen? Will you | come where the brook gently
toil, Ev'ry | plea-sure its val - ue en- | han - cing As we | gather our wealth from the | soil? Will you | come when the sha-dow of

s : .m ,m | m .s ,s :s .s ,s | s :s .s ,s | s .s ,s :s .s ,s | s : .$^{d'}$s ,s | s .s ,s :s .s ,s
d : .d ,d | d .d ,d :d .d ,d | d :m .m ,m | s .s ,s :s_1 .s_1 ,s_1 | d : .^{f}d ,d | d .d ,d :d .d ,d

glid - ing, Murmurs soft in the cool si-lent shade, Where the vio - let is mod - est-ly hid - ing In its low - ly but beau-ti - ful bed?
ev-'ning Round our cottage her mantle has thrown? Fresh en - joyment and hap-piness breathing Ev-er thus when our la-bour is done!

s :m .m ,m | r .r ,r :r .s ,f | m : .m ,m | m .m ,m :m .s ,s | l :f .f ,m | r .r ,r :s .t_1 ,r | d :-.
d :d .d ,d | t_1 .t_1 ,t_1 :t_1 .t_1 ,t_1 | d : .d ,d | d .d ,d :d .d ,d | d :l_1 .t_1 ,d | s_1 .s_1 ,s_1 :s_1 .f_1 ,f_1 | m_1 :-.

gliding, Murmurs | soft in the cool silent | shade, Where the | vio - let is mod-est-ly | hid - ing In its | low - ly but beau-ti-ful | bed?
ev'ning Round our | cot-tage her mantle has | thrown? Fresh en- | joyment and happiness | breath-ing Ev-er | thus when our la-bour is | done!

m :s .s ,s | s .s ,s :s .s ,s | s : .s ,s | s .s ,s :s .m ,m | f :f .r ,d | t_1 .t_1 ,t_1 :t_1 .r ,t_1 | d :-.
d :d .d ,d | s_1 .s_1 ,s_1 :s_1 .s_1 ,s_1 | d : .d ,d | d .d ,d :d .d ,d | f_1 :f_1 .f_1 ,f_1 | s_1 .s_1 ,s_1 :s_1 .s_1 ,s_1 | d_1 :-.

NOTES AND NOTIONS.

BY RICHARD WADDINGTON,

Ex-President of the Half-time Council of Teachers.

'He best can paint them who shall feel them most,' says Pope, and it is because teachers recognise this truism that Mr. Yoxall bore the Liberal colours in Bassetlaw; and now Mr. Gray is to carry the Conservative colours in North-West Ham. Many a pedagogue has had a hard struggle to make his politics subservient to his Unionism, and this has been the harder in most cases owing to the fact that all the Union's Parliamentary action has been on one side. The coincidence is remarkable but purely accidental. As a Gladstonian-Conservative-Tory-Socialist, I congratulate Mr. Gray. He has done yeoman service for the Union, and the electors of North-West Ham will be well and truly served by him, if, at the next election, they return him to represent them at Westminster.

'Tis a consummation
Devoutly to be wish'd.

* * * * *

But 'to return to our wethers.' How stands the Union now on the question of Parliamentary representation? Mr. Yoxall has a strong claim on the Liberal party. Mr. Gray has a majority of thirty-one against him—truly a good chance. The claim on the Liberal Party is much stronger. The Union fought Bassetlaw for favours to come. The Union has a claim to a reasonably safe seat at the next election. Next year the income of the Parliamentary Fund will be little short of £2,500, and with such an income we can run two or three candidates with ease. But we must squander no more money in fighting for position. Mr. Gray's selection shows that it is possible to get a chance without fighting forlorn hopes. I believe we did well to fight Bassetlaw to show we were in earnest, but the time has gone by when we need to enter a contest to convince either party we've got the men and money too.

* * * * *

At the Westminster Dinner to Messrs. Yoxall and Bowden, Mr. Macnamara read some interesting extracts from School Reports in 1850. Here are some of them:—

'The mistress is an intelligent young woman, whose manner is rather remarkable for energy than sweetness.'

'The master a superannuated labourer, a highly respectable man of the old parochial fashion.'

'An industrious and sensible man, but provincial in dialect.'

'Has been here forty-one years, with no qualifications for the office.'

'The master an old sea captain, is not the man to impart a good moral tone.'

'Mistress a kind, motherly dame without any pretensions to efficiency.'

'The master is assisted by a very nice young person, the wife of the rector's gardener.'

'I have no doubt but that the master is a man of good principle and character, but according to the best judgment I can form, it would be a blessing if he would retire from his office of schoolmaster.'

'The master has formerly been a sailor. His salary is only £7 a year and a house.'

'The master, seventy-two years old, is an old Peninsula soldier, and he is pensioned by the War Office, fortunately for him, for his salary is only £8 4s. 6d. a year with a garden.'

* * * * *

Looking back forty years, the progress made in the position of the teacher is remarkable. In 1850 'My Lords' said, 'A teacher who obtains their Lordships' lowest certificate of merit, and the grant of augmentation annexed to it, will be in the receipt of £45 per annum and a house rent-free, or £55 per annum if he is not provided with a house rent-free. My Lords are of opinion that such a minimum *is not fixed at too low a point.*'

* * * * *

In 1861 the Royal Commission on Education, anxious to justify the late Mr. Robert Lowe, said, 'The average of their receipts is, probably, at the present moment somewhat artificially raised by a demand in excess of supply. A certificated master, besides a house, receives (in salary and Government grant together) about £90 per annum, and a certificated mistress £60. This is liberal payment *for young men and women, the children frequently of artisans and labourers* in a comfortable and honourable position.' Will the next forty years show such marked progress as the last?

* * * * *

I believe the progress will be as marked. The organisation of the secondary schools, with a free and unimpeded flow from the primary to the secondary schools, will open up a wide field of possibilities. The sweeping away of the bars to something like regular attendance, and the extension of the school life throughout the country to thirteen years of age; the enlargement of the curriculum in the rural schools, with a more equitable subsidy to maintain increased teaching power, and a more generous supply of apparatus. How long are the educational opportunities of the nation to be circumscribed by the weight of the purse of a few local magnates posing as members of a School Board or school managers?

* * * * *

A little boy who had a French governess, and was always obliged to talk French, was playing in the barn one day, and suddenly discovered that the building was on fire. Rushing to the school-room, he exclaimed, 'Oh, mademoiselle, I don't know whether it's *le feu* or *la feu;* but, anyhow, there's a big blaze in the barn!'

* * * * *

And with necessity,
The tyrant's plea, excused his devilish deeds.

The other day I called attention through the columns of the *Daily Chronicle* to the Bamfurlong Colliery Disaster. This fatal disaster was caused by the action of a boy of thirteen, who was engaged down the mine. Examined by Mr. Aspinwall, the boy said *he left school two years ago, and when he went to work he was not asked for a labour certificate.* As the law at present stands, a boy can go down the mine at twelve after passing the standard fixed by the Local Bye-laws for total exemption, but the custom very generally prevails of omitting the certificate. Whenever I visit a mining district I hear the same story. Now factory life is hard enough for a child, but it is mere child's play to sending little boys of twelve to work underground. The agreement at Berlin was

that no child should work underground before reaching fourteen, and none too high. The Executive have decided to call the attention of the Home Office and the Education Department to this evidence. If my readers have any cases of irregular employment in the mine, send them on to me at St. James', Bolton.

* * * * *

AT a meeting the other day the chairman was counting the votes as follows :—'Six for. Against, fifteen two, fifteen four, fifteen six, and a pair——" when a sudden roar of laughter broke forth, and reminded him that the business was more serious than 'cribbage.'

* * * * *

AT the same meeting a lady was descanting on the patriotism of the gentlemen, when somebody cried out, 'What about the ladies?' The chairman brought down the house by announcing that the male embraces the female.

* * * * *

WITH 23,000 members, it is time the Union took up the question of the poorly-paid teacher in earnest. There are 95 certificated head masters, 175 certificated assistant masters, 1,484 certificated head mistresses, and 2,912 certificated assistant mistresses receiving less than £50 per annum. The Union ought to alter this. A shilling levy would produce over a thousand pounds —sufficient to pay forty of these to throw up their appointments, failing a reasonable advance. The effect of the first forty notices would settle the question for the remainder, I feel certain. What says the next Conference to a shilling levy?

* * * * *

THE question of secondary education bristles with difficulties. Primary school teachers feel that there must be free passage from the primary schools to the secondary schools, both for teachers and scholars; and in this there must be reciprocity. In many ways the primary school teachers would gain from the accession of the secondary school teachers to the one common brotherhood, but at present there is no certification of secondary teachers. Any person may open a secondary school. Are the primary school appointments to be open to any and every teacher who is engaged in a very often miscalled private school? Some form of registration must precede any attempt to settle the question of secondary education, and it seems to me that the question of registration is a very vital portion of the Government's programme. The teachers in our genuine secondary schools must be as anxious as the primary school teachers to see this portion of the programme.

* * * * *

Is it not time the Voluntarists repeated the 1870 compromise? The question of religious instruction is very much in the background. There is no tangible reason against a satisfactory arrangement whereby the voluntary schools could be placed once more on their legs. Provision might easily be made to allow the religious instruction to be given by the clergy out of the two hours. Take up the list of any London Church Training College and you find the great majority trained in these nurseries of church teachers enter the Board School. The dual system as at present recognised is an obstacle to educational progress. To the right and to the left teachers and children are working in ill-lighted and badly-arranged buildings. The supply of apparatus and the extent of the teaching power is at the very lowest possible point the Govern- will allow. And these things must perforce continue unless the various denominations follow the advice of Archdeacon Wilson and endeavour to find a reasonable solution.

* * * * *

DURING the Christmas Holidays a Special Committee of Welsh Teachers met at Shrewsbury to consider the drafting of a definite curriculum, uniformly adapted, and embodying the principle of teaching English through the Welsh, and conversely. The report of this committee bears upon its pages evidence of the work of experts, and this policy of delegation to particular districts of special difficulties deserves extension. In their appendix to the report the committee suggest in detail an English-Welsh scheme for the standards, to be taken as a class subject. The scheme contains a syllabus for large schools and for schools with an average not exceeding sixty, as well as for Infants' Schools and classes. They further suggest that the recitation and songs may be wholly or in part in Welsh, at the discretion of the managers. And why not? Surely now the Welsh teachers have laid down a reasonable scheme, Mr. Acland will see to its insertion in the Code of 1893.

* * * * *

HERE is some interesting reading for the sentimentalists who would make it possible only to administer corporal punishment to the sons of the aristocracy. The five School Boards which allow fully-certificated assistants the power to administer corporal punishment report as follows :—

The Clerk to the Nottingham School Board adds.—'So far as we can discover, this regulation has tended rather to decrease than increase the actual number of cases of punishment in our schools, and it has certainly assisted very materially in doing away with the very obnoxious forms of clandestine punishment which were previously too often resorted to. All teachers, both head and assistant, appear to heartily appreciate the concession, and declare themselves most anxious to carry out the spirit of the amended regulation.'

The Clerk to the School Board for Glasgow writes.—'Speaking generally, the regulations have worked satisfactorily, cases of excessive punishment are very rare, and where complaints have been made by parents, it has been invariably found either that the charges were incorrect, or that the punishment was deserved and not severe.'

The Clerk to the School Board for Edinburgh writes.—'Very few complaints have been lodged by parents or others with this Board in regard to corporal punishment inflicted by any of their teachers. Indeed, the complaints are so rare that I have at present no recollection when the last one was made.'

The Clerk to the School Board for Aberdeen writes.—'This Board has had no occasion to interfere with the reasonable discretion of its teachers in the matter of punishment, and does not fetter its assistants by any rule on the subject.'

The Clerk to the School Board for Dundee writes.—'These regulations have been found to work in a highly satisfactory manner.'

The Executive has wisely decided to send out a circular-letter containing this information to the various School Boards where the right of the assistant is taken away by regulations.

THE question of freedom of classification in Drawing is not yet satisfactory. In the three R.'s the teacher may present a child in none, one, or two of the subjects of Standard I. Can the teacher do the same in drawing? Next take the case of a teacher who took drawing for the first time last year. Standard IV. was the highest. This year, all the children who were presented in Standard IV. have gone to work. He therefore has no Standard V. But in one district the form was returned, and the managers told that some must be presented in the Fifth, and that, if the children had all gone, some of the last year's Third Standard children must be presented in the Fifth. And this is perfect freedom of classification! Let there be no mistake about the teachers' demand—the drawing must be on the same footing as the other subjects!

* * * * *

THE secretary of the Bolton Teachers' Association (Mr. D. W. M. Thompson), in the twenty-first annual report, says on the question of 'Free Education':—'The School Board has decided to entirely abolish fees at the close of each school year; so that in twelve months we may expect to see the children of Bolton—at least, that part which is being educated by the Board—receiving their instruction at the hands of the teachers "free, gratis, and for nothing." Will the voluntary schools follow suit? It is not for me to say. But one thing I will say, that I trust if the voluntary schools are declared free the managers will not draw the deficit from the salaries of the teachers. There is nothing in my knowledge that will more endanger the future of their success than a policy of "docking the teachers."' These be courageous words, coming from a voluntary teacher. Your hand, friend Thompson!

* * * * *

HAVE you read the *Infants' Mistress?* See that you get it! It is the best pennyworth of every-day school management I have seen for some time. The matter is written by teachers to aid the daily life of teachers, and the scene is often the board and easel within the four walls of a school. Advertising is not my line, but I feel sure my readers will forgive me when they find what a good thing I am calling their attention to.

* * * * *

BOLTON has just got new bye-laws. The total exemption standard is the Seventh, and the half-time standard the Fourth. Well done, Bolton! The land of clogs is the first to adopt Standard VII. for total exemption. If we don't get 'Age and Attendance' before next September, the standard for full-time employment in a factory at thirteen will be the Seventh in Bolton.

—o—

CONVERSATIONAL LESSONS IN CHEMISTRY.

BY THOMAS CARTWRIGHT, B.A., B.SC. (LOND.).

First Class Honoursman in Chemistry, S. and A. Department. Lecturer in Chemistry to the Middlesex County Council, and in Physiography to the Birkbeck Institution, E.C.

AT the request of many readers and as a natural complement to our PRACTICAL TEACHER Set of Apparatus, we now give a set of chemicals to be used in connection with these lessons. In ordering from Mr. A. Gallenkamp, 6, Cross Street, Finsbury Pavement, E.C., the coupon of the current number of the PRACTICAL TEACHER must be sent; and the PRACTICAL TEACHER Set of Chemicals must be specifically asked for.

The price of the set is £1 13s. 6d., including bottles; packing cases and carriage extra.

'PRACTICAL TEACHER' LIST OF CHEMICALS AND REAGENTS.

2 lb. sulphuric acid.	1 lb. sulphur roll.
2 lb. hydrochloric acid.	¼ lb. flowers of sulphur.
1 lb. nitric acid.	¼ lb. carbon disulphide.
1 oz. tartaric acid.	1 oz. waxy phosphorus.
¼ lb. glacial acetic acid.	2 lb. manganese dioxide.
¼ lb. potash alum.	2 oz. litmus.
¼ lb. potassium nitrate.	1 oz. reduced iron.
¼ lb. potassium bichromate.	¼ lb. iron filings.
1 lb. potassium chlorate.	¼ lb. iron pyrites.
¼ lb. potassium ferrocyanide.	finest iron wire.
½ oz. potassium iodide.	¼ lb. ferous sulphate (copperas).
¼ lb. potassium hydrate.	2 oz. magnetic oxide of iron.
½ lb. sodium carbonate.	2 oz. sesquioxide of iron.
¼ lb. sodium hydrate.	1 lb. granulated zinc.
¼ lb. sodium acetate.	2 oz. antimony.
¼ lb. copper turnings.	2 oz. litharge.
¼ lb. copper sulphate.	2 oz. lead nitrate.
1 oz. copper oxide.	2 oz. lead acetate.
1 oz. mercuric oxide.	tinfoil.
1 oz. mercuric chloride.	2 oz. cream of tartar.
1 oz. mercuric nitrate.	sq. in. of aluminium.
4 oz. calcium chloride.	small specimen of native cinnabar.
1 lb. bleaching powder.	small specimen of native sulphur.
1 lb. ammonic hydrate.	1 oz. ether.
¼ lb. ammonic chloride.	½ oz. sodium.
¼ lb. ammonic nitrate.	
¼ lb. ammonic carbonate.	

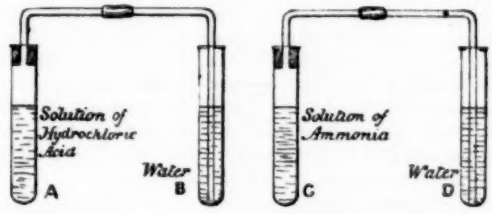
LESSON II.

In our last Lesson we found out that water is hard because it is impure. We may sum up this impurity by saying that it is due to mineral or organic substances held in solution. The minerals most commonly occurring are the sulphates and carbonates of the metals calcium and magnesium; but other minerals are found dissolved in the water of various districts, and you have certainly heard of the medicinal value of the mineral springs of such places as Harrogate, in England, Spa and Vichy on the Continent. Here is a table giving the matter dissolved in the waters of the place mentioned in connection therewith:—

DISTRICT.	MATTER DISSOLVED.	NAME OF MINERAL WATER.
Epsom	Magnesium sulphate...	Epsom Salt Waters.
Vichy	Sodium carbonate	Alkaline Waters.
Harrogate	Sulphuretted hydrogen	Sulphuretted Waters.
Spa	Iron carbonate, etc. ...	Chalybeate Waters.
Iceland	Silica	Silicious Waters.
.....	Carbon dioxide and mineral matters...	Apollinaris and Seltzer Waters.
.....		

What happened to our bluestone, nitre, soda, alum, salt, and sugar, when put into water? They disappeared, or were dissolved. What took place when sealing-wax, oil, sulphur, indiarubber, and camphor were placed in the water? They remained unaltered. When you put several spoonfuls of sugar in your small cup of tea, what do you notice after drinking the tea? There is some sugar remaining at the bottom of the cup. Do you notice any remainder when you are not extravagant, but use only a moderate amount of sugar? No. Now carefully consider these two cases, and try to give me an explanation of them. The tea can only dissolve a certain amount of sugar, and all put in above this amount simply falls to the bottom. There is a time when the tea or water is completely charged with sugar; has enough of it, so to speak. Exactly so. Now, when your clothes are so drenched with water that no more can be soaked up, what do you frequently say in such a case? That I am saturated, and I suppose we use this word for the 'enough' state of the water. Yes. Now take a test-tube and put some water in it, to which add some finely-powdered

nitre, taking care to dissolve each portion before adding more. Now, sir, I have reached the point of saturation, for upon adding more no amount of shaking will bring about solution. Well, heat it. Ah, now it dissolves, and so does a second and a third portion; but at last it is again saturated. What do you infer, then, as to the effect of heat upon solution? That it enables a body to dissolve more than when it is cold. Yes. We express that by saying that heat raises the point of saturation, to which rule there are one or two exceptions. Here is another tube, containing what is commonly called liquid ammonia—a misleading term, for ammonia is a very light gas, and instead of being liquified in this tube, it is merely dissolved. Here, also, is a third test-tube, containing what is commonly called muriatic or hydrochloric acid (spirits of salt). This, again, is misleading, for hydrochloric acid is a gas, and this liquid is merely a saturated solution of the gas in water. Now take some of this litmus solution—made by dissolving some litmus in water and filtering. Pour it into the acid. Why, it has changed to red. Well, now pour some of the reddened litmus into the ammonia solution, and note what happens. It is again blue. Next take two tubes fitted with a cork with a leading tube, to each of which fasten an ⌐ shaped piece of tubing by means of indiarubber tubing, and let these two pieces of tubing be placed beneath the surface of some pure water in two other test-tubes, thus:—



Apply heat to the tubes A and C, but do not boil the contents. Now, tell me what is taking place in B and D. Bubbles of gas are passing into them, and seem to be dissolved, for they do not reach the surface of the liquid. Examine the tubes B and D with litmus paper. In B, sir, the blue turns red, and in D the red turns blue. Very good; and what do you think has happened, considering what we did just now with the litmus? It is plain that some of the gas has in each case gone into the water. Has it been driven over by the heat, sir? Yes. But you said that heat causes liquids to dissolve more and more of a substance, and here the heat acts quite in a contrary way, and has caused less and less to be held in solution? Yes, that is so, the rule being that heat gives a solvent, such as water, a greater solvent power with respect to solids and liquids, but causes dissolved gas to be driven out of solution. Look at our nitre tube, sir, why, there is quite a large quantity of nitre undissolved now? Well, what else could you expect. If more is dissolved upon heating, the excess should surely be deposited on cooling. Now, let us carefully place some of the re-deposited saltpetre upon a glass slide and examine them with a magnifying glass. Tell me what you observe with respect to the shape of the particles. They are all of exactly the same form. Yes, we say the substance has crystallised, and each little particle is called a crystal, and cooling a hot saturated solution of a substance is one way of getting it in a crystalline form. Here is another experiment pointing to another mode of obtaining crystals. Prepare a strong hot solution of bluestone (copper sulphate). Now, hang a solid substance in the solution—a bit of stone will do.

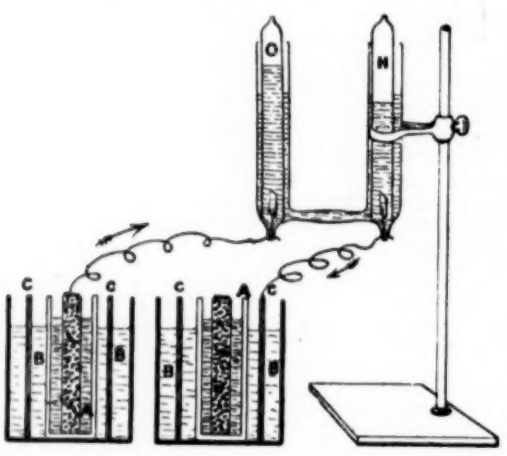
After a time we will return to the solution and see what happens as it cools. Meanwhile, take your evaporating dish and put into it some crystals of washing soda (sodium carbonate it really is). Note that the dish is perfectly dry. Now put it on the sand-bath placed on your tripod stand, and heat. There is water in the dish, sir, and the soda has dissolved. That is quite so; and now tell me where the water came from? It must have come from the soda, but I can't understand how. You are quite right, and the only explanation I can give is that the water and the sodium carbonate are combined together in the washing soda and are forced asunder by the heat. Look again. Of course the water has now evaporated, and I see what I suppose is the sodium carbonate. Quite so. That is what we call 'anhydrous carbonate of soda,' whereas washing soda contains water, and is called 'hydrated carbonate of soda.' Would you not like to test the bluestone in the same way? Yes, sir. Well, first of all, tell me what you would expect to have left when the water—supposing any to be present—has been driven off? A blue powder, of course, sir. That is quite evident. Well, conduct your experiment yourself, and tell me what you note. It has changed colour, sir, and is now white. Indeed, then it was not such a good guess, after all. What have you learnt from these two latter experiments? That water helps to crystallise bodies, and—I think it is water which gives bodies their colour. Not quite so sweeping a rule, and then you will be correct—say, rather, that the regular geometrical or crystalline form of *some* bodies is due to the water which they contain, and that this water of crystallisation, as it is called, is the cause of the colour of some bodies, and then you will be right. Again, let us return to our bluestone and the pebble suspended therein. How beautiful, sir! There is quite a collection of crystals gathered round the stone. Yes, there is a crop of crystals there, and you see now a second method of producing crystals. Show evaporation is a third method.

Take a small portion of sodium about the size of a pea. Wrap the end of a piece of copper wire round it so as to imprison the sodium in a kind of cage. Now put a small quantity of water in your evaporating dish and fill a test-tube with water. With your thumb stop up the mouth of the test-tube, and invert it under the water in the dish, thus preventing the escape of water from the test-tube. Next place the cage under the water, and under the mouth of the test-tube. What do you notice? The sodium escapes and mounts to the surface of the water in the test-tube, showing the size of the pellet decreases, and at the same time the level of the water sinks. Now that the metal is gone, remove the tube and apply a light. Well? The gas burns with a pale blue flame. Yes; and you must take my word for it that the gas is hydrogen. What do you learn with respect to the composition of water? That it contains hydrogen.

Take your electrolytic cell. Remove the graduated tubes and fill them with water, slightly acidulated. Do the same with the cell itself, and then insert the tubes under water. Procure one or two Bunsen's cells and fit them up. Join the terminals to the platinum wires of the electrolytic cell. The current now passes through the water in the cell, and minute bubbles of gas collect at the ends of the two pieces of platinum foil—the electrodes. Notice carefully the two tubes. Well? The quantity of gas in one tube is twice that of the other. Very good. Now with which plate, the zinc or the carbon, is the fuller tube connected? With the zinc. Quite true; the electrode connecting the zinc is called the negative pole, and we shall see now what the gas is, which collects in double quantity and at the negative pole. Take this taper and apply a light to the mouth of the tube. Describe the result. The gas burns exactly as before, and is probably hydrogen. Your inference is correct. Proceed now to insert this smouldering chip into the other tube. It burns brighter and brighter, and even bursts into flame. Yes; and the gas which thus kindles a glowing chip is oxygen, of which we shall have more to say later on. Perhaps you can now tell me what the composition of water is, especially if I help you by saying that all bodies are elements, compounds, or mixtures. In a mixture the component elements are not always in the same ratio. If the hydrogen of water is always exactly twice the volume of the oxygen, water, of course, is not a mixture. What, then, is it? A compound, for it contains two gases; and I have read somewhere that an element is a simple substance containing only one kind of substance or matter. Well done; now fully define water as it appears to you from the above analysis by electricity, or electrolysis, as we term it. Water is a compound of oxygen and hydrogen, the hydrogen being

twice the measure or volume of the oxygen. Nicely put; and I think we cannot do better than bring our second lesson to a conclusion at this point.

Note on battery.—If the cells be not available they can be fitted up in the following way:—Get two pint or quart jars. Take a sheet of zinc, and immerse it in weak sulphuric acid; then with an old tooth-brush pass a quantity of quicksilver over the two surfaces until the zinc is completely covered with mercury or amalgamated. Next, solder a piece of copper wire to the zinc plate, which should previously be folded in a cylindrical form. Now get a bar of gas carbon, and bore some holes in the top and sides; then cap it with lead, to which solder a piece of copper wire from the zinc carbon. Next solder copper wires to the other zinc and to the other carbon, and connect them with the platinum wires of your electrolytic cell. Fill up the porous cells halfway with strong nitric acid, and the outside cell with weak sulphuric acid. The current will pass through the water as above described, and in its passage will decompose it. The following figure will make plain what is intended to be conveyed:—



A, porous cell, in which is the strong nitric acid and the carbon plate. C, zinc cylinders immersed in the weak sulphuric acid which is contained in the outer cell, B.

H, hydrogen; O, oxygen.

The arrows indicate the direction of the current.

(To be continued.)

IN THE BABIES' ROOM: WHAT TO DO, AND HOW TO DO IT.

BY MISS J. W. WARREN,

Inspectress of Infant Schools, Leicester School Board.

We have now to do with a time-honoured play, which through successive ages has been a general favourite in almost all lands. By the borders of the sea, in our own dear home, and in places remote from its influence alike, sand finds its place as a means of amusement and instruction. Who that has watched the keen delight of a school party visiting the sea for one day in the year hasn't felt that to bring the children in contact with the warm, yellow sands was in itself a pleasure, even apart from the added enjoyment of the rippling waves and the endless shells? My paper will be to guide teachers in its use in a more restricted means, but, nevertheless, in such a manner as to render it, I hope, indispensable to your baby-room collection of occupations.

Play with dry sand.—Sand can be bought in any small town or large village; it is always cheap and usually clean and fine. If you are unable to obtain it fine, buy coarse grain and sift it, wash frequently, and spread out on a sunny day to dry. Keep your sand in a strong wooden box.

In many parts of England sandpits occur, and a quantity can be obtained free of cost by scraping the already cut sections. Choose your sand where the sand-martin builds; it is always there of the finest quality, and generally of a warm red colour, but as to buy presents no difficulty, perhaps a word more is too much on this initial difficulty.

Distribution.—A small tin cup (kept for the purpose) filled and given to each child will be found enough; but care must be taken not to give less, or its levelling in their wooden trays will be both difficult and unsatisfactory.

Mode of Work.—In a former occupation I have suggested wooden trays—these are an absolute necessity for the sand. But we will suppose you have them. Supply each child with one, and turn into it one tin mugful of *perfectly dry fine sand.* Now, if you are a teacher of ready resource I need say no more; the mere sight of your little ones so equipped will afford you food for contemplation and action, for while one will immediately fulfil the law of his nature by accumulation (making heaps), another will demonstrate an equally important law by distributing it over the tray and probably outside its boundaries too, just giving the teacher the necessary hints that direction in these two natural ways may well be taken.

Regulated play.—After pouring in each tray a mugful of sand and into your own the same, direct your little ones to spread it with *right hand*, holding tray steady with *left;* let each small child grasp tray at bottom edge for this steadying purpose, as it will be there he will need the exercise later on.

Now practise by yourself the levelling of the sand in this way. Grasp your tray on each side with both hands, lift a tiny bit from table, and jerk it quickly from side to side about *three* times. You will find the sand distributes itself all over the tray delightfully smooth; it will now be ready for work. Babies, I know, manage this beautifully, and can get results quite as good as their teachers. Need I point out how useful the exercise is as a means of steadying action, guiding the wee hands, and learning the movements of sand? At this point teacher should look round the class, assisting the individual children by actually helping them; it is worth while to go over and over this exercise—letting babies disturb sand by tipping trays up, down, to left and to right. Several minutes spent in these actions well ordered by the teacher will do away entirely with the rather natural rough play that comes with its unaided use. Even these mites will learn to guide their readily-moved mass so that it shall go so far and no further in one or the other direction. A pretty sight it is to see a class busily engaged making finger marks in their levelled sand, and here and there one giving it a shake to wipe out a mistake. So quickly does the material adjust itself to their desires that one is tempted to wonder how we ever thought of the slate and pencil for the same work in days that are past, but I am afraid I spend too much time in this very simple occupation; so I shall imagine it is done, and done satisfactorily. You have each baby quite ready to make his mark on his

sand, and can then do exactly as you like in the following suggested plan :—

Work to be done.—Lines, curves, slopes made with the index finger of the right hand. Tray to be held at bottom as just suggested. Some teachers will like to use a blunt pointed wooden knitting pen, or an ordinary artist's '*stump*' for this work. It is not recommended by the writer ; we are too artificial in our dealings with very young children, and the tools natural to them are, as Froebel says, their senses and *limbs*.

Now a word as to these lines, curves, slopes. Merely as such it would be disastrous to use them, but a young teacher must embody them. The line must be a man, the curve a bridge, the slope a hill—and a nice interesting story must accompany each. Children of tender age must be encouraged to do things ; it is an essential part of training. Use the whole surface of your sand, make all things large. A line drawn in middle from top to bottom ; a curve from bottom left corner through centre top side to bottom right corner, and so on. The idea of the occupation is to guide the child later on to the use of the pencil, and this must be borne in mind all through the exercises. It will be found that the finger-pad drawn straight through the sand will dispose of it on each side and leave a pretty finger mark. This will for the first be quite sufficient to interest your class, but later on one must meet the needs of the little ones by filling up this line. Now, the *haricot* beans arranged in regular order in these lines will meet the want, and really quite pretty designs can be made with them. The Indian maize also answers well, but I would urge teachers only to give the bean or grain when quite satisfied with the drawings. Children of very tender years can make this exercise really artistic, and great facility in the use of the sand follows when a teacher really interests herself in the play. It will be found that the letters can be easily made, and this *sand writing* is the only approach to pencil and slate that can be permitted. The writing slope can be taught easily, but it will be better to make things and to call them by their name, and to let the children suggest what can be made ; all objects mentioned in the regular list of things usually made by the Kindergatnerin will here find a place. I would especially impress upon young babies' room teachers not to despise this occupation, not to make either a trouble or a punishment about a little spill of sand ; it can do no harm, it can only cleanse whatever it comes in contact with, and no harm whatever is done. A teacher who becomes fidgetty without more cause than a baby's disaster with sand is not fit for her high office.

Caution.—When your play is done, be sure to collect the sand and place it in the general box. Let pupils pick out the beans, and put those, too, away. Remember that this will be a lesson in *number*, *tidiness*, *order*, *regular work* and *form*, in addition being a good exercise in discipline kindly administered.

Ponds, gardens, soldiers, lambs, boys, classes, slates, windows, train-rails, books, animal forms, fruits, nuts, trees—indeed everything that appeals to their known object forms—can be placed and drawn. To the baby, it is his canvas, his book, his playground. It is in little things we must seek for the germ of great—as in small actions we sew the seed of great deeds ; and so we shall learn that to *write in sand* is more useful than the old adage would lead us to believe.

RECENT EXAMINATION OF A MIXED SCHOOL.

Standard I.

The class was divided into two sections, the teacher being allowed to make the division. Then one part was tested in writing by transcription from a book, and the other in arithmetic by sums dictated.

Arithmetic :—

1. 57 + 609 + 98 + 175 + 66.
2. 421 — 165.
3. 360 — 129.

Answers.—(1) 1005. (2) 256. (3) 231.

Mental Arithmetic.—1. I met a boy coming to school this morning, and he had two shillings ; how many pence had he ?

2. He went to a shop and bought sugar worth 10d. and bread worth 8d. How much change did he get ?

3. The same little boy went to another shop, and he wanted three dozen apples, but he only had 35. What was the difference ?

Geography.—A plan of the room being placed before the class, such questions were asked as the following :—

Point the place of the stove on the plan.
The corner where this boy sits.
Where do I stand ?
Show the way out of the school-room.
Point where the window before me is on the plan.
Show the way from this stove to that door over there.

Standard II.

Dictation.—The following passage was dictated from a class reading book :—

'I am, indeed, a weak and tiny thing ; but there are many others like me ; and by all helping together we cover the earth with beauty, and fill the air with sweetness ! So you do, little flower ; so you do ! Thanks for your beautiful colours.'

Grammar.—The children, answering orally, were required to pick out nouns and verbs from their reading lessons. They were not asked to form sentences.

Mental Arithmetic.—49 + 19. Divide that number of marbles among a number of boys, giving 6 to each. How many boys would there be ?

Find the price of ten cows when one costs £4.

Reading.—About half the class were heard to read from their ordinary reading books—Royal Reader No. II.

Recitation.—The piece prepared was 'Little Jim.' The Inspector selected five children from each row, and the teacher was asked to add the best five. Among the questions asked were the following :—

What was his father doing ?
Did Jim grow up like his father ? What then ?
Who entered the room after he was dead ?
Who was kneeling by his death-bed ?
What did the father and mother do when they met ?
'Stricken couple kneel.' Who were the 'stricken couple' ?
What do you mean by *stricken* ?

Arithmetic.—1. 71,210 — 9,099.

2. 71,150 ÷ 8.

3. 74,658 × 94.

Answers.—(1) 62,111. (2) 8893 + 6 over. (3) 7,017,852.

Geography.—What is an island ? a lake ? a cape ? a strait ?

What name is given to a narrow neck of land joining two larger pieces of land?

What is the land next the sea called? Another name. What is a beach?

STANDARD III.

Arithmetic.—This was tested by cards, of which we give two specimens :—

Boys.—1. Divide 160,938 by 296.

2. From £90,010 19s. 10½d. subtract £89 19s. 10½d.

3. A boy was 17 years old in 1889; when will he be 38 years old?

4. Two brothers had £7 13s. 9½d.; their sister had £6 13s. 4d. What had they together?

Girls.—1. Multiply 34,185 by 56.

2. From £9,441 18s. 4d. take £9,414 19s. 4½d.

3. Multiply half of 186 by one-fourth of 336.

4. The divisor is 93, the dividend is 90,300; what is the quotient?

ANSWERS.—*B.* (1) 543 + 210 over. (2) £89,920 19s. 11¾d. (3) 1,910. (4) £14 7s. 1½d.

G. (1) 1,914,360. (2) £26 18s. 11½d. (3) 7,812. (4) 970 + 90 over.

Geography.—What sea is on the east of England? on the west? on the south?

Which is the largest county in England?

Suppose I come south along the coast and turn into the Humber, what cape shall I pass?

What town is opposite Spurn Head?

What two rivers flow into the Humber?

What river drains Yorkshire?

What town stands on the Trent?

What range of mountains is on the West of Yorkshire?

Is the Plain of York fertile?

Into how many parts is Yorkshire divided?

Suppose I walk across the Pennine Chain, to what county should I come?

What manufactures are carried on in Lancashire?

Which is the largest town engaged in the cotton manufacture?

What large opening separates Essex from Kent?

Suppose I sail up the Thames, what counties are on my right side? on my left?

Name the forests of England.

What is Dean Forest noted for?

Name the island to the south of Hampshire.

What capes are there?

Grammar.—The questioning was oral, and the children had to pick out the nouns, verbs, etc., from their reading books.

STANDARD IV.

Arithmetic.—Specimen card.

1. £687 12s. 3½d. × 95.

2. £7,000 12s. 0½d. ÷ 59.

3. Reduce 11,011 gallons to half-pints.

4. A servant was engaged at 2s. 3d. per week for 7½ months (4 weeks to a month). Find her earnings.

ANSWERS.—(1) £65,523 7s. 8½d. (2) £118 13s. 1d. + $\frac{5}{59}$ f. (3) 176,176 half-pints. (4) £3 7s. 6d.

Grammar.—This subject was taken orally, and the following sentences were given for parsing :—

(*a*) Mary's hat blew away.

(*b*) Three cheers our brave sailors gave for the Queen of England.

Give sentences containing an Intransitive Verb, a Transitive Verb, a Noun in the Possessive Case, a Common Gender; the words—me, them, mother; John, gave, fish.

What do you mean by Passive Voice? A Regular and an Irregular Verb? Common Gender? Nominative Case of Address? Give an example of each.

Geography.—The course taken included Scotland, Ireland, and British North America.

What do you know about Montreal, Ottawa, Belfast, St. John, and Dublin?

What are the exports of Ireland? What are the chief occupations of the people of British Columbia, North-West Territory, Newfoundland, and Manitoba?

What is the capital of the Dominion of Canada?

What work is carried on in the valley of the Ottawa?

What minerals are found in Newfoundland? And in the cove of Cork?

STANDARD V.

Arithmetic.—1. Find the cost of 71 miles 5 fur. 44 yds. at £83 6s. 8d. per mile.

2. Find what is equal to $\frac{5}{8} - \frac{1}{7} + \frac{3}{5} + \frac{3}{4}$.

3. Make the following bill :—

11 chickens at 2s. 9d. each.
28 lb. butter at 1s. 5d. per lb.
9 geese, each 12 lb., at 1s. 1d. per lb.
360 eggs at 15 for 1s.

4. A grocer mixed 13 lb. of tea at 2s. 11½d. per lb. with 96 lb. of tea at 3s. 2½d. What was the price of the mixture per lb.?

ANSWERS.—(1) £5,970 16s. 8d. (2) $2\frac{3}{8}$. (3) £1 10s. 3d. + £1 19s. 8d. + £5 17s. + £1 4s. = £10 10s. 11d. (4) 3s. $2\frac{31}{78}$d.

Geography.—In this subject Standards V. and VI. were taught together, and the geography of Europe was prepared.

Name the countries which make up the Great Plain of Europe.

Name other plains in Europe.

What is the chief town in the Plain of Hungary?

On what river does Buda-Pesth stand?

What is the chief port of France?

What port exports a great quantity of wine?

How is it there are deltas at the mouths of some rivers flowing into the Mediterranean Sea?

What town stands on Lake Geneva?

What town stands at the junction of the Rhone and Saone?

What port stands at the mouth of the Seine?

What is the capital of Russia?

Name some tributaries of the Danube? of the Volga?

Give the Latitude and Longitude of Cracow.

Show the Iron Gate of the Danube.

Grammar.—(*a*) Analyse and Parse—

'The morning feast with joy they brought
To feed their young with tender care.'

(*b*) Form nouns from *dark, friend, true, beg, merry, know.*

Form adjectives from *wood, joy, greed, truth, quarrel, boy.*

STANDARD VI.

Arithmetic.—Specimen card.

1. By how much is $\frac{1}{16}$ of £5 greater than ·3 of £5?

2. Divide ·055501808 by 7·0536.

3. In what time will £3,500 amount to £5,250 at 4 per cent?

4. A woman bought 1,000 eggs at 5 for 6d. and sold

them at 6 for 5d. What did she gain or lose on 300 eggs?

ANSWERS.—(1) £3 0s. 5d. (2) ·0078. (3) 12½ years. (4) 9s. 2d. loss.

Grammar.—(*a*) Analyse and Parse—'I can trust him, for I have proved his honesty.'

(*b*) 1. Analyse—

'For well he knew the silly fly
Would soon come back again.'

2. Give the meaning of the prefixes in each of the following words:—*occur*, *immortal*, *purpose*, *suppose*, *nonsense*.

Composition.—The children had their choice of three subjects:—

(*a*) Advantages of Early Rising.
(*b*) The Post Office.
(*c*) About the Month of October.

Music.—Standards I. and II. were examined together, and had this test in time-reading:—

| d :— | d :d | d :d | d :d | d :— | d :— ‖

Standards III. to VI. were also examined together, and had these tests:—

Time.

| d :d.d :d | : : | d.d :d :— | d : :d ‖

Tune.

d m s m d s_1 l_1 s_1 d t_1 d

—o—

DOMESTIC ECONOMY.

STAGE I.

A.

1. How would you wash flannels?
2. What are the advantages of cotton as a clothing material?
3. What are the functions of food?
4. What foods:—(*a*) Form flesh?
(*b*) Harden bones?
(*c*) Give heat in body?

B.

1. What substances are found in eggs, and what is the function of each in the body?
2. Of what is soap composed, and how is it made? What is the best kind of soap for ordinary purposes?
3. What materials are made of wool, and what are the advantages of these?
4. How would you wash white things; such as table-cloths, sheets, etc.?

C.

1. Why is milk such a valuable food?
2. What are the uses of clothing?
3. How would you iron a gentleman's shirt?
4. Where are fatty foods digested, and what by?

D.

1. How do carbonaceous and nitrogenous foods differ from one another in composition and function?
2. What is the importance of cleanliness?
3. If you can, give the price per yard of:—Flannel, Good Calico, Print, and say which you consider best, white or unbleached calico. (Give reasons.)
4. What are the uses of (*a*) Blue, (*b*) Soap, (*c*) Soda, (*a*) Borax, when washing?

E.

1. A man has bread and cheese for dinner. Say what food stuffs are found in these, and what is the use of each one in the body.
2. Name the different processes, in their order, through which the different articles cast off by a family to be washed must go through before they are again fit to wear.
3. What are the advantages and disadvantages of linen as a clothing material?
4. What do you know of:—Legumen, Cereals, Albumen, Digestion?

F.

1. How is cotton manufactured into clothing materials? Give a short account of the process.
2. From what foods do we obtain starch, and what is its use in the body?
3. How would you wash coloured things?
4. How would you:—
(*a*) Remove ink stains from a table-cloth?
(*b*) Remove grease stains from a carpet?

G.

1. What substances are given off by the body, and by what organs are these substances excreted?
2. A man has to work hard in the air all day. If you had to prepare him a cheap dinner, what would you get him, and why?
3. What kind of clothing is it best to wear next the skin, and for what reasons is it best to wear these?
4. How would you make:—(*a*) Hot, and (*b*) Cold-water starch, and for what purpose should each be used?

H.

1. Give simple directions for starching and ironing a man's collar.
2. What is the best kind of water for washing, and why? Where would you get it from?
3. Do you know of any pernicious practices in clothing? If so, name two of them, and say why they are injurious.
4. What are the uses of salt, water, oxygen, and sulphur respectively in the body?

I.

1. Why is it necessary to have a mixed diet?
2. How are skins made into leather?
3. Describe any methods you know of by which water may be softened.
4. What preparations would you make before commencing to wash your clothes?

J.

1. What are cereals, what are their constituents, and what are the functions of these constituents?
2. What are the evils of eating too much food?
3. Name three labour-saving utensils or machines used on washing-days. What can you say in favour of, and what against, the use of these?
4. Suppose a child to be kept without food for a time, what results would follow?

K.

1. How is it that the young of animals can subsist on milk alone?
2. What is meant by—(*a*) conductor of heat; (*b*) proteid; (*c*) nutriment; (*a*) perspiration?
3. How would you wash woollen stockings?

4. What materials are made of cotton, and for what articles are these materials used?

L.

1. Which do you consider most nutritious: a dinner of meat alone, or bread alone, or meat and bread? Give your reasons.
2. How would you wash a chemise?
3. What are the best kinds of boots to wear?
4. Make a list of articles which will probably require washing at the end of a fortnight, in a family of father, mother, and one child.

M.

1. Which is the best clothing material for wearing in cold weather? Give reasons why it is better than others.
2. Why are meat, bread, and cheese, respectively, so much used as food?
3. What is hard water? Is all water hard? If not, say how it is made so.
4. How would you wash a print dress?

N.

1. From what animals are the most common furs obtained? What is fur, and what are its advantages as a clothing material?
2. Why is cleanliness of the skin so important?
3. What food-stuffs are found in milk, and what is the value of each in the body?
4. How would you wash greasy cloths?

O.

1. Why should clothes be aired before being put away? How would you do this?
2. What is tea and what is cocoa? Which is of most value as a food, and why?
3. What is the use of borax, blue, and soap, respectively, when washing?
4. What is leather? What articles of dress are made of it, and what are its advantages?

P.

1. Give a few simple rules for taking care of clothes.
2. Write all you know about soap.
3. What do you mean by a mixed diet? Why is a mixed diet best?
4. Of what is water composed? From what sources may good drinking water be obtained?

Q.

1. What is silk? What materials are made of it, and what are its advantages?
2. What are cereals, and what are pulses? Give a short list of each. What kind of foods are they?
3. How would you wash a table-cloth which was ink stained?
4. What foods are present in a rice pudding, and what is the use of each in the body?

R.

1. Say what you know of:—(1) Gluten; (2) Amyline; (3) Digestion; (4) Albumenoid?
2. Give a list of six fatty foods and say what you can of each.
3. Make a list of the clothes you think a girl would want to take with her on leaving home to become a nursemaid.
4. If you were just commencing housekeeping, what articles would you purchase if you intended to do your washing at home?

S.

1. What are the evil effects of tight clothing?
2. What food-stuffs are found in eggs, bread, oatmeal, and cabbages respectively, and what is the use of each in the body?
3. What day in the week would you choose for washing, and why? What work would you do the day before and the day after?
4. Describe any ways you know of for softening water. Why is it best when soft?

T.

1. What is linen? Give a short account of the processes of manufacture.
2. From which of our foods are the following obtained, and of what value or use are they in the body?—Phosphate and carbonate of lime, salts of potash, phosphorus, gluten, gelatin.
3. How would you wash a man's coloured cotton shirt?
4. What must be done to food before it can nourish the body? Where does this take place?

U.

1. If you were choosing the material for a new dress, what should guide you in your choice as to colour, material, and price?
2. What are condiments and spices? What are their uses? Give a short list of each.
3. What are the constituents of milk, and what is the nutritive value of each? What foods are made from milk?
4. How would you wash blankets, and when?

V.

1. How is it a baby can live on milk alone?
2. What are the following made of, and what are they used for—(1) Diaper; (2) Chintz; (3) Serge; (4) Ribbon; (5) Cretonne; (6) Velvet?
3. From what may the following be obtained, and what is the value of each as a food—(1) Legumen; (2) Gluten; (3) Sulphur; (4) Sugar; (5) Gelatin?
4. What is washing soda manufactured from? What are its uses and disadvantages respectively?

W.

1. Why should we frequently wash underclothing?
2. Write all you know about coffee.
3. What are the uses of water in the body?
4. Describe exactly what you would do to make a pair of dirty linen cuffs fit to wear again?

X.

1. What is butter; how does it act in the body? Say all you can about it.
2. How would you test cotton and linen goods when purchasing them?
3. If you were ordering a frock for a small child, what sort of neck and sleeves would you order, and why?
4. Is soap used in washing all kinds of clothes? If not, why is it used for some, and why is it *not* used for others?

Y.

1. What do you know of the following:—Sago, tapioca, peas, wheat, and oatmeal?

2. How would you remove mud and grease spots respectively from clothing, and when would you do this?
3. What care should be taken when washing flannels?
4. Could a person live on a diet consisting of fat, sugar, tapioca, and butter? If not, why?

Z.

1. Write what you know of pepper, mustard, cloves, and vinegar.
2. What are the dangers of wearing damp clothes and wearing tight shoes respectively?
3. What is condensed milk? If you wished to feed a baby on cow's milk how would you prepare it?
4. The colours of some materials are often said to 'run' when washed; how would you prevent this? Some articles are said to 'run up' or shrink during washing; what would you do to prevent this?

[Next month we shall give a complete set of Domestic Economy Test Cards for Stage II.—ED.]

—o—

HOW I TRAIN MY PUPIL TEACHERS.

BY MISS PALMER,

Head Mistress Ackmar Road Infant School, Fulham.

THERE is no part of my professional work in which I have felt so great an interest, and taken so much pleasure, as in the training of pupil teachers. Recognising the vital importance and lasting effects of earliest impressions and habits formed in any sphere of action, I think too much stress cannot be laid on the necessity of a watchful care being exercised in all that appertains to the conduct and career of those preparing for the responsible office of teaching.

Keeping in view this end, I take as an essential principle that great discrimination should be used in making a wise

SELECTION, guided by attention to the following special points:—

(*a*) Intellectual capacity.
(*b*) High moral character.
(*c*) Suitability of manner, deportment, etc.
(*d*) Social position, and whether home influence is likely to supplement and encourage effort in the direction of improvement and advancement.

To secure the possession of these qualities in the candidates of my choice, I have, in many cases, been fortunate in the opportunity of personal observation and study of character, by having had them under my charge as scholars in an evening school in a good district. Thus, on the entrance of the candidate to the day-school, as no time is lost in discovering capabilities, attainments, character, etc., systematic work can be at once commenced.

TRAINING.—In the schools established by the School Board for London, the Pupil Teachers receive in the departments in which they are apprenticed all their instruction in method, school management, and class teaching; besides which the Head Teacher is expected to exercise a general supervision in the preparation of home work, and to take an interest in the success of the periodical tests given at the central classes, the results being recorded in a journal kept in the school.

1. PRACTICAL WORK.—The principle, that true education exists in the school itself, is now so generally acknowledged that I need scarcely say my first endeavour is to try and impress the young teachers with the primary significance and value of the practical and professional part of their calling. Involving, as it does, so much of the intellectual work of their curriculum, its faithful and intelligent performance is the sure road to success.

In order that no false start may be made, I never give the sole charge of a class to the beginner; but attach her to an experienced assistant, whose judgment and good sense warrant my confidence, to direct and assist her when I am personally unable to do so. In this way she has the benefit of constant supervision and correction, as well as opportunity of learning tried and successful methods of dealing with difficulties in instruction and class management. In turn, all the lessons of the Time Table are given by the Pupil Teacher, and improvement in style and language cultivated. Once, and when necessary twice, each week a formal lesson on physical phenomena or elementary science is prepared, full notes written, and writing, composition, arrangement, and illustration corrected. This criticism lesson is then given, accompanied by experiments, drawings, and appropriate specimens from our School Museum. The result of this lesson I record in the Pupil Teachers' journal, and at the end of the quarter give an inclusive mark for the whole series. In preparing these lessons a great stimulus is given to the acquirement of general knowledge, as to be successful they must embrace an extensive and varied course of reading. The habit of systematic arrangement of matter, tabulation of facts, and graphic illustration—points which tell so much in all examinations—are hereby acquired. To this methodical training I attribute the success in teaching of my Pupil Teachers, as well as the praise bestowed on them by H.M.I.S.

2. INSTRUCTION.—For instruction in other subjects the Pupil Teachers are collectively taught by certificated teachers at the classes provided, and home work set for the evening. Any advice on how to study, choice of books, etc., I have always been ready to give, as so much depends on methodical work. My own plan in giving this instruction to Pupil Teachers has been to minimise the difficulty of teaching at the same time two or three of different years, by arranging a Time Table (a copy of which, with slight modifications, I append to this article), showing provision for private study in the case of one or two, while the other received a special explanation. These lessons were given for one hour, after the school was dismissed, and home work was set on the subject in question. Half an hour before the morning school was taken for correction, lessons in arrangement, hints on solution of questions, and general matters. In all subjects of study I made a point that no learning by heart should suffice where other means of acquiring knowledge, such as association of ideas, illustration, etc., were possible. Thus, in studying *Geography*, a sketch map of the country was first accurately drawn, and divisions, physical features, manufacturing districts, coalfields, etc., filled in, followed later by taking one portion or characteristic in succession of the same country. In this way, map drawing was combined with the actual learning of facts. Lines of latitude

and longitude were insisted on because of their special value in facilitating the correct drawing of any part of the ocean bordering, *e.g.*, Mediterranean, when countries of Southern Europe and mainland of Africa are known.

In *Grammar*, certain definitions had to be mastered as an exercise in memory. The rules, however, were made as few as possible; for the power of language comes from study and assiduous reading, rather than a mechanical adherence to rule. The genealogical charts and dates in *History* were also committed to memory, but for real instruction in the first subject I found the Analytical method the most successful, and in the latter, a continuity of the principal facts arranged in bare outline, according to year of apprenticeship, was given, to be filled in progressively by extra reading and study.

The use of *memoria technica* as legitimate I encouraged only so far as it was an aid to the retention of important facts when other more intelligent means failed. In History especially I found some study of terminology essential.

A few lessons in Algebra, as far as Simple Equations, were combined with the regular lessons in Arithmetic, on account of its usefulness in assisting the solution of such problems as are often found in the Scholarship paper.

Outside the ordinary course I advised Drawing, particularly Subject I. (Science and Art Directory) and Freehand; and from the beginning of the apprenticeship a study of the elements of science was taken up, preparatory to the science subject of Physiography (formerly of Physical Geography). This science I consider most useful for Pupil Teachers, both as an aid to Geography and as a means of extending their ideas in other directions. The examination should take place in the third or fourth year of apprenticeship. If the candidate is successful in gaining a first class, she is credited with thirty marks towards the Scholarship Examination. A further subject which could only be suggested in the case of an exceptionally good student, by which fifty marks might be gained, is Agriculture.* The preparation for obtaining a first class in the advanced stage I found, experimentally, to take about twenty-five hours' study. It has been proved that it is quite possible to obtain a high place on the Scholarship List without these additional subjects. The advantage, however, of gaining them (where the conditions are favorable) cannot be over-estimated, not entirely on account of the increase in the possible number of marks, but because of their educational value, and the bearing they have on other branches of instruction. I may add that in the first years of apprenticeship frequent examinations were given, with a monthly review of the work. The last year was devoted to a more special preparation for the final examination, consisting of a general review, explanation of all remaining difficulties, writing model answers.

In teaching I have given prominence to the following points:—

(*a*) How to study, and the use of Text Books; showing that the actual acquisition of knowledge may be of less importance than its proper organisation.

TIME TABLE FOR WORK OF TWO P.T.'s, *e.g.*, FIRST AND THIRD YEARS.

Day.	Morning ½-Hour.	Afternoon 1 Hour.	Home-Work, about 2 Hours.
Monday.	Correction of Grammar and History. Stitches in Needlework.	Explanation of Arithmetic problems (senior). Private work (junior).	Working examples in Arithmetic from rules explained. Written exercise in History. French exercise.
Tuesday.	Correction of French and Arithmetic exercises. Showing model answers in History.	*English* Literature, Derivation, Parsing, and Analysis.	Exercises in Grammar, with study. Time exercise in Arithmetic. Theory of Music, study and answers.
Wednesday.	Explanation of points of difficulty in Grammar. Literature (poetry). Answers to Music questions.	Arithmetic, private work (senior). Explanation of Problems (junior).	Examples in Arithmetic and Algebra. Answering question on Method. Drawing Sketch Map.
Thursday.	Correction of Arithmetic. Observations on Method. Mode of answering questions.	Lessons in Geography and Physiography. Sketch map to be used.	Memory exercise in Geography and study. Arithmetic exercise. Question in Grammar for composition.
Friday.	Arrangement of Geography answers. Showing faults of composition.	Sewing instruction.	Arithmetic, working examples. Memory exercise in History. Parsing and Analysis exercise. Needlework specimen.

Note.—In addition to obligatory work given, an exercise in Drawing was recommended; also the reading of an instructive book, notes to be made, and meanings of words determined.

* A Thorough Course is *Elementary Agriculture*, by A. T. Burgess, Member of Royal Agricultural Society, Bronze Medallist, and First on List in 1888, is begun in No. 1 *Infants' Mistress*, published at this office.

(*b*) Method of drawing up sketch of lesson denoting leading facts; but filling in detail from actual study and research.

(*c*) The use of tabulating, and epitomising, pointing out when such methods are inappropriate.

(*d*) The value of diagrams and illustrations, and their proper introduction.

(*e*) Necessity of taking rough notes in reading, in an intelligent manner, for future application.

(*f*) Advantage of taking in some periodical containing 'up to date' notes and information; the one recommended and used by my Pupil Teachers being THE PRACTICAL TEACHER.

INTERCOURSE.—My opinion has always been that, outside the discharge of the actual professional duties relative to Pupil Teachers, there are many opportunities of personal influence which may properly come under the head of *training*. For instance after the power of example, there is no more effective element, than a sympathetic friendship extending beyond what is merely official. Such a friendship as this has also a direct bearing on the intellectual progress, for I have found that more real and lasting knowledge is gained incidentally than by committing to memory many pages of a manual, without interchange of thought.

Other details to which I have given attention are:—

(*a*) To instil a sense of the dignity of the position of a teacher, with the power which knowledge gives, and the happiness and freedom from worry accompanying the feeling of ability to perform the work willed. Also by treating with great confidence the young Pupil Teacher to show how dishonourable and ungrateful any want of trustworthiness or straightforwardness would be.

(*b*) Never to correct their faults before the class, on account of the loss of self-respect which follows. In all corrections to use great tact that it may be seen that such discipline is used as a forming principle, rather than the outcome of a desire to find fault. In a word, the conditions for the attainment of high principles should be made as favourable as possible.

(*c*) To advise and encourage the cultivation of a taste for reading. Apart from the regular course of study, and the books necessarily used, I have proposed as liberal an amount of reading as the circumstances of the case would allow, for the fact that without it all rule-teaching can only result in imparting an empirical knowledge is undeniable. A writer of the day has said that ten pages of a good book, read with accuracy, will make an educated person, and that in this accuracy consists the entire difference of education and non-education. The want of time has been alleged as an obstacle in the way of reading, as a means of improvement, by Pupil Teachers, especially in the case of those engaged the whole day in their schools, but I would insist that the advantage is not so much in the *number*, as the *kind* of books read. A few really good works mastered, with the aid of a dictionary, when needed, are of more educational value than a superficial reading of a much greater variety. The ultimate bearing of this reading on any literary examination needs no argument, and the ease and pleasure which it gives for study, with the relief from mechanical grind, is a reward which the intelligent student is the first to acknowledge.

The kind of books suggested were such as the following:—

Characteristic poems of the best poets, notably that from which the lines for repetition at the annual examination were chosen; Green's 'History of the English People,' English Men of Letters Series; recent books of travel, 'Fairyland of Science,' 'Ocean of Air,' Lockyer's 'Lessons on Astronomy,' 'Discoveries and Inventions of the 19th Century,' Judd's 'Volcanoes,' those of the Waverley Novels with direct historical interest, etc., etc.

RECREATION.—The exercise of the theory advocated by Locke and other noted educationists, viz., the essentiality of physical relaxation as well as mental, must depend mainly on the resources of the neighbourhood in which the school is situate. Help can be extended in this direction by pointing out suitable means of recreation for spare time. The innumerable experiences and the extension of ideas gained by travel induces me to recommend, where possible, the passing of a holiday in a foreign country, or, at least, at a distance from the locality of work.

In these days of competition and progress it would seem superfluous to urge the necessity of the instructor keeping well in advance of the pupil, as, for instance, in the case of the introduction of any new subject. Yet I feel that this is a matter so significant that all obstacles should be overcome to secure it; and in comparison with its importance, where the will is determined, this is no difficult task, as frequently an intense desire and anticipation can transform possibility into reality. How often it is proved that the noblest results are achieved where the greatest drawbacks exist; for by adverse circumstances latent energies are called forth, and unsuspected powers revealed.

Therefore, I may remark, in conclusion, that I believe the whole secret of the perfection and success in the training of *well-chosen* Pupil Teachers lies in the influence, ability, and power to surmount difficulties possessed by those responsible for their care.

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We much regret that owing to the pressure on our space this month we are compelled to hold over the '1893 Certificate Class,' by Dr. George Beach, M.A. To avoid disappointment, however, we shall be pleased, upon receipt of a penny stamp for postage, to send to any of our subscribers a copy of this contribution. Many reviews are also crowded out.

FEBRUARY, 1893.

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L'AVARE.

(*Molière*).

TRANSLATED BY PROFESSOR DARQUE.—*(Author of 'Pupil Teachers' French Course.')*

L'AVARE.

VALÈRE. Hé quoi! charmante Élise, vous devenez mélancolique, après les obligeantes assurances que vous avez eu la bonté de me donner de votre foi? Je vous voi[1] soupirer, hélas! au milieu de ma joie! Est-ce du regret, dites-moi, de m'avoir fait heureux? et vous repentez-vous[2] de cet engagement où mes feux[3] ont pu vous contraindre?

ÉLISE. Non, Valère, je ne puis pas me repentir de tout ce que je fais pour vous. Je m'y sens entraîner[4] par une trop douce puissance, et je n'ai pas même la force de souhaiter[5] que les choses ne fussent[6] pas. Mais, à vous dire vrai, le succès me donne de l'inquiétude; et je crains fort de vous aimer un peu plus que je ne[7] devrais.

VALÈRE. Eh! que pouvez-vous craindre, Élise, dans les bontés que vous avez pour moi?

ÉLISE. Hélas! cent choses à la fois: l'emportement d'un[8] père, les reproches d'une famille, les censures du monde; mais plus que tout, Valère, le changement de votre cœur, et cette froideur criminelle dont ceux de votre sexe payent le plus souvent les témoignages trop ardents d'une innocente[9] amour.

VALÈRE. Ah! ne me faites pas ce tort, de juger de moi par les autres. Soupçonnez-moi de tout, Élise, plutôt que de manquer à ce que je vous doi[10]. Je vous aime trop pour cela; et mon amour pour vous durera autant que ma vie.

ÉLISE. Ah! Valère, chacun tient les mêmes discours. Tous les hommes sont semblables par les paroles; et ce n'est que les[11] actions qui les découvrent différens.

VALÈRE. Puisque les seules actions font connaître ce que nous sommes, attendez donc au moins à juger de mon cœur par elles, et ne me cherchez point de crimes dans les injustes craintes d'une fâcheuse prévoyance. Ne m'assassinez point, je vous prie, par les sensibles coups d'un soupçon outrageux; et donnez-moi le temps de vous convaincre, par mille et mille preuves, de l'honnêteté de mes feux[12].

ÉLISE. Hélas! qu'avec facilité on se laisse persuader par les personnes que l'on aime! Oui, Valère, je tiens[13] votre cœur incapable de m'abuser. Je crois que vous m'aimez d'un[14] véritable amour, et que vous me serez fidèle: je n'en[15] veux point du tout douter, et je

THE MISER.

VALÈRE. What! charming Eliza, you are becoming melancholy, after the kind promises you have had the kindness to give me of your love. I see you sigh, alas! in the midst of my joy! Is it regret of (do you regret) having made me happy? and do you repent that engagement to which my love has compelled you?

ÉLISE. No, Valère, I cannot repent all I am doing for you, I feel myself drawn to it by too gentle a power, and I have not even the strength to wish that things should be otherwise. But to tell you the truth, the success makes me uneasy; and I am afraid I love you a little more than I ought.

VALÈRE. Ah! what can you have to fear, Eliza, in the kindness you have for me?

ÉLISE. Alas! a hundred things at once: the anger of my father, the reproaches of my family, the censure of the world; but above all, Valère, the inconstancy of your heart, and that cruel coldness with which those of your sex most often repay the too ardent proofs of an innocent love.

VALÈRE. Ah! do not do me that wrong, to judge of me by others. Suspect me of everything, Eliza, except that I could fail in my duty towards you. I love you too much for that; and my love for you will last as long as my life.

ÉLISE. Ah! Valère, everyone says the same thing. All men are alike in language; and it is only their actions that show they are different.

VALÈRE. Since actions alone make known what we are, wait, therefore, at least to judge of my heart by them, and do not look for crimes in the unjust fears of a sad foresight. Do not torment me, I pray you, with the hard blows of an outrageous suspicion; and give me time to convince you, by thousands of proofs, of the honesty of my love.

ÉLISE. Alas! how easily one allows oneself to be persuaded by those whom one loves. Yes, Valère, I believe your heart is incapable to deceive me. I believe that you love me truly, and that you will be faithful to me. I will not at all doubt it, and I confine my sorrow

NOTES.

(1) *Voi* instead of *vois*, a licence which both verse and prose writers frequently took before the present century.

(2) *Se repentir* invariably requires *de* before the name of the thing repented of.

(3) *Feu*, literally 'fire.'

(4) *Entraîner*, literally 'to drag,' 'to draw.'

(5) *Désirer* is preferred to *souhaiter* when we wish for ourselves.

(6) *Les choses ne fussent pas.* This mode of expression would be avoided now.

(7) Notice the use of *ne* after all comparatives of superiority (or inferiority) whenever the second term of the comparison is denied.

(8) Observe how studiously writers of the last century avoided the use of the proper word.

(9) *Amour* is now masculine in the singular, though it retains the feminine gender in the plural.

(10) *Doi* instead of *dois*; a licence now indulged in only by verse writers.

(11) The French avoid the use of the possessive pronouns whenever there can be no doubt as to who is the possessor.

(12) The adjective *feu*, lately deceased, has the plural *feus*.

(13) *Je tiens*, literally 'I hold.' Notice the expression *tenir à quelqu'un*, to be fond of someone.

(14) Molière should not perhaps have made *amour* of the masculine gender after having made it feminine.

(15) *En* is equivalent to *de cela*, and *douter* invariably requires that preposition.

retranche[16] mon chagrin aux appréhensions du blâme qu'on pourra me donner.

VALÈRE. Mais pourquoi cette inquiétude ?

ÉLISE. Je n'aurais rien à craindre si tout le monde vous voyait des yeux dont je vous voi ; et je trouve en votre personne de quoi[17] avoir raison aux choses que je fais pour vous. Mon cœur, pour sa défense, a tout votre mérite, appuyé du secours d'une reconnaissance où le ciel m'engage envers vous. Je me représente à toute heure ce péril étonnant, qui commença de nous offrir aux regards l'un de l'autre ; cette générosité surprenante qui vous fit risquer votre vie, pour dérober la mienne à la fureur des ondes ; ces soins pleins de tendresse, que vous me fîtes éclater après m'avoir tirée de l'eau ; et les hommages assidus de cet ardent amour, que ni le temps ni les difficultés n'ont rebuté, et qui, vous faisant négliger et[18] parens et patrie, arrête vos pas en ces lieux, y tient en ma faveur votre fortune déguisée, et vous a réduit, pour me voir, à vous revêtir de l'emploi de domestique[19] de mon père. Tout cela fait chez[20] moi sans doute un merveilleux effet ; et c'en est assez à mes yeux, pour me justifier l'engagement où j'ai pu consentir ; mais ce n'est pas assez, peut-être, pour le justifier aux autres ; et je ne suis pas sûre qu'on entre[21] dans mes sentiments.

VALÈRE. De tout ce que vous avez dit, ce n'est que par mon seul amour que je prétends, auprès de vous, mériter quelque chose ; et, quant aux scrupules que vous avez, votre père lui-même ne prend que trop soin de vous justifier à tout le monde ; et l'excès de son avarice, et la manière austère dont il vit avec ses enfans, pourraient autoriser des choses plus étranges. Pardonnez-moi, charmante Élise, si j'en[22] parle ainsi devant vous. Vous savez que sur ce chapitre on n'en peut pas dire de bien. Mais enfin, si je puis, comme je l'espère, retrouver mes parens, nous n'aurons pas beaucoup de peine à nous le rendre favorable. J'en attends des nouvelles avec impatience, et j'en irai chercher moi-même, si elles tardent à venir.

ÉLISE. Ah ! Valère, ne bougez d'ici, je vous prie, et songez seulement à vous bien mettre[23] dans l'esprit de mon père.

VALÈRE. Vous voyez comme je m'y prends, et les adroites complaisances qu'il m'a fallu mettre en usage pour m'introduire à son service ; sous quel masque de sympathie et de rapports de sentimens je me déguise pour lui plaire, et quel personnage je joue tous les jours avec lui, afin d'acquérir[24] sa tendresse.

to the fear of the blame of which I may be the object.

VALÈRE. But why that anxiety?

ÉLISE. I should have nothing to fear if everybody saw you with the eyes with which I see you, and I find in your person reasons to be right in what I do for you. My heart, in its defence, has all your merit, supported by a gratitude by which heaven binds me to you. I unceasingly picture to myself that astonishing danger which first brought us together ; that surprising generosity which made you endanger your life in order to save mine from the fury of the waves ; those attentions full of tenderness which you displayed after you had taken me out of the water ; and the constant homage of that ardent love which neither time nor difficulties have disheartened, and which, while making you neglect both your parents and country, detains you in this place, keeps your fortune disguised in my favour, and has reduced you, in order to see me, to assume the office of one of my father's dependents. All that doubtless produces on me a most wonderful effect, and that is enough in my eyes to justify to me the engagement to which I have consented ; but it is not perhaps sufficient to justify it to others ; and I am not sure that they will share my sentiments.

VALÈRE. Of all you have said, it is only through my love alone that I intend to deserve something from you ; and, as for the scruples you have, your father himself only takes too much care to justify you in the eyes of everybody ; and his excessive avarice, and the austere manner in which he lives with his children, might authorise more strange things. Forgive me, charming Eliza, if I speak of him thus before you. You know that on that chapter one cannot speak well of him. But lastly if I can, as I hope to do, find my parents, we shall not have much difficulty to propitiate him. I am impatiently expecting news of them, and I shall myself go in search of them if I do not hear soon.

ELISE. Ah ! Valère, do not stir from here, I pray you, and think only of winning my father's good opinions.

VALÈRE. You see how I set to work, and the skilful condescension I have been obliged to have recourse to in order to enter his service ; under what mask of sympathy and sentiment I disguise myself to please him, and what parts I act every day with him to win his affection.

(To be continued.)

(16) *Je retranche.* This mode of expression is not to be imitated. We would rather say : *je borne, je limite, je restreins.*

(17) *De quoi* may here be rendered by 'the wherewith.' Notice the expression : *cet homme a de quoi*, that man is well off.

(18) *Et. . . et.* This is a Latinism which is best rendered by 'both. . . and.'

(19) *Domestiques*, literally 'servants.' Formerly that word was applied to any person holding any office in a gentleman's household.

(20) *Chez* generally means 'at the house of' : *il est chez son oncle ou chez lui*, he is at the house of his uncle or at home ; but not infrequently stands for 'amongst' : *c'était la coutume chez les Grecs*, it was the custom among the Greeks.

(21) *Entrer*, to enter into, is often synonymous with *partager*, to share.

(22) *De lui* would now be preferred to *en*, because there is emphasis on the pronoun.

(23) Notice the expression : *il s'est mis dans l'esprit de faire cela*, he put it into his head to do that.

(24) This mode of expression is not to be imitated. We would rather say, for instance, *pour me faire aimer de lui.*

NOTES ON ADVANCED AND HONOURS PHYSIOGRAPHY.

BY R. A. GREGORY, F.R.A.S.

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THE principal subject of this month's notes is spectrum analysis applied to celestial bodies. This has been dealt with somewhat fully for several reasons. In the first place, students find considerable difficulty in getting a clear idea of the principles of spectroscopy, more especially if they have not the use of a spectroscope. Secondly, questions on spectroscopic matters are set in 'Advanced and Honours Physiography' every year, thus testifying to the importance of the subject.

The heads of the Physiography syllabus dealt with are as follows:—

Study of the Radiant Energy of Celestial Bodies.—Classification into hot and cold masses; bodies studied by their radiation alone; by their radiation and absorption; by their reflection. Stars: classification according to their spectra; variable stars; coloured stars. Solar spectrum. Fraunhofer lines.

On these matters read Lockyer's 'Lessons,' 1-4, 39, 40, and 47; or Young, pp. 123-129, pp. 243-271. For revision and general physical geography, read my 'Elementary Physiography,' pp. 286-322.

Luminous and Non-Luminous Bodies.—A body which shines by its own light, such as the sun, a star, or a candle, is said to be self-luminous; those like the moon, which can only be seen by reflected light, are non-luminous.

Nature of Light.—A weightless, invisible material known as *ether*, but not to be confounded with the sulphuric ether of chemists, is supposed to pervade the universe. A luminous body is continually disturbing the ether and sending waves through it, just as waves spread out from the point where a stone falls upon the surface of water. When these waves strike the eye, the sensation of sight is produced. The distance between two successive crests or troughs of a wave is known as the *wave-length*. The sensation of sound is produced by atmospheric waves striking the drum of the ear. If only a few waves reach the ear in a second, a low note is heard. A larger number of waves impinging upon the ear produces a note of a higher pitch. The analogy between light and sound can be shown as follows:—

LIGHT.	SOUND.
Consists of waves produced in the ether by a luminous body.	Consists of waves produced in the atmosphere by a sounding body.
A difference of wave-length produces different colours.	A difference of wave-length produces difference of pitch.
The ascending colour scale is Red, Orange, Yellow, Green, Blue, Indigo, Violet. (R, O, Y, G, B, I, V.)	The ascending scale of musical pitch is C, D, E, F, G, A, B.
There are light-waves too long and too short to produce any visual impression.	There are sound-waves too long and too short to be perceived.

A difference exists in the character of waves of light and waves of sound. If one end of a rope is held in the hand and shaken up and down, waves are sent along it, each part of the rope simply moving up and down. The line of travel is thus at right angles to the motion of the particles of the rope. This is the case with light. An infinite number of ropes can be imagined to project from a luminous body, such as the sun, each of which is continually being disturbed in the manner indicated. A sounding body, which we will suppose to be a globe, behaves as if it alternately expanded and contracted, thus compressing and rarefying the surrounding atmosphere. In this case the line of travel coincides with the direction of disturbance.

Propagation and Intensity of Light.—Light travels in straight lines. Consider a luminous point at the centre of a globe. All the surface of the globe is equally illuminated, and this applies to a globe of any radius. Now, the surfaces of globes vary as the square of the radii. Globes having radii of 1, 2, 3, or 4 feet would therefore have surfaces proportional to 1^2, 2^2, 3^2, and 4^2. If a luminous point were successively placed at the centre of each, we get the same amount of light spread over surfaces which are to one another as 1 : 4 : 9 : 16. Hence a unit of area on a globe two feet in radius is illuminated by one-quarter the light-intensity received at a distance of one foot from the source; a unit of area three feet from the source receives one-ninth; and so on for any other distance, the intensity being 'inversely proportional to the square of the distance.'

The Velocity of Light.—From a large number of experiments, the rate at which light travels has been found to be 186,300 miles per second. The following are the principles of the different methods employed in the determination:—

Jupiter's Satellite Method.—The periods of all Jupiter's satellites progressively increase by the same amount as the distance between the earth and the Jovian system is increased. An apparent decrease of periodic times of the satellites occurs when Jupiter and the earth are approaching one another. The inference is that the observed differences are due to light having a finite velocity.

With Jupiter in opposition—

Observed periodic times of satellites = true periodic times of satellites.

With Jupiter in conjunction—

Observed periodic times of satellites = 1,000 seconds behind the times calculated from true periods.

But when in conjunction Jupiter is more distant by the diameter of the earth's orbit (186,000,000 miles) than when in opposition. Hence, if light takes 1,000 seconds to travel 186,000,000 miles, its rate is 186,000 miles in one second. The exact time taken in travelling from the sun to the earth is 499 seconds. This is known as the *constant of the equation of light*.

Fizeau's Method.—A mirror and a source of light are separated by as long a distance as possible. It is required to find the time taken by a flash of light to travel along the known distance from the source to the mirror and back. A cogwheel is placed in front of a source of light, so that a beam can pass out to the mirror from the space between two teeth. It is revolved so rapidly that while a beam is travelling to the mirror and back, a tooth moves into the position of the space that let it out. In other words, when the reflected beam arrives home, a tooth bars its way. The rate of revolution gives the time taken by the tooth to move into the position previously occupied by the space. And the time thus calculated is that taken by light to traverse twice the distance between the stations. From this the distance travelled in one second is easily obtained.

Foucault's Method.—A beam of light impinges upon a mirror capable of being rapidly rotated, is reflected to a concave mirror, returns again to the first mirror, and thence to the light source. If the first mirror is at rest, the reflected rays travel back along the same paths as the incident rays, and the image coincides with the object. The first mirror is rapidly rotated. It turns through a small angle, while a beam of light is passing from it to the concave mirror and back. Hence the reflected rays have not the same direction as the incident rays—that is to say, the image does not coincide with the object. Half the amount of separation gives the angle through which the mirror turns, while light traverses twice the distance between the mirrors. The time taken to turn through this angle is furnished by observation of the rate of rotation. Both distance and time are therefore known, so the velocity of light per second can be found by proportion.

Cornu, Michelson, Newcomb, and other observers have determined the velocity of light, but though the apparatus they employed was much more delicate than that used by Fizeau and Foucault, the methods were substantially the same.

Decomposition of Light.—When a beam of white light traverses a prism from one face to the other, it emerges in an altered condition. The differences are (1) the beam is bent out of its original direction; (2) the white light has been transformed into a band tinted like the rainbow; (3) the colour most bent out of the original direction is violet, that least bent is red. From this it appears that violet light is *more refrangible* than indigo, indigo more refrangible than blue, and so on up to red, which is the least refrangible end of the strip. The scale of colour thus produced is called a *spectrum*. We can only see the part which affects our sense of sight. *Ultra* violet rays exist beyond the violet, and *infra-red* rays exist of longer wave-length than red light.

The spectrum is produced by the overlapping of coloured images of the aperture through which the beam passes. If the aperture is large, the images are large and there is an appreciable difference of colour between the sides of each. The colour at any part of the spectrum is then produced by the most refrangible side of one image overlapping the least refrangible side of the next. An impure colour is the result. A *pure spectrum* is obtained, (1) By using a fine slit to admit the beam to the prism. The images are then so narrow that there is practically no difference of colour between the sides. Each image can be considered as representing an elementary colour, and since 'different colours have different refrangibilities,' all the images lying side by side produce a spectrum. (2) By adjusting the prism at *minimum deviation*. Suppose light of only one colour falls upon the prism. It is deviated from its original direction. By rotating the prism on its axis, a position of least or minimum deviation is found. When this is the case, the image is least blurred. The position of mini-

mum deviation differs for different colours. (3) By placing a convex lens at a distance from the slit equal to its focal length. The light from the slit then falls upon the lens and emerges in a parallel beam to impinge upon the prism.

The decomposition of light is also effected by means of a *diffraction grating*. This consists of a surface upon which a large number of equi-distant lines (from 500 to 20,000 lines to the inch) have been ruled. If lines are ruled on clear glass, a spectrum is seen when looking through the glass at the illuminated slit. Usually a metal surface is ruled. The beam falls upon the surface and is reflected as a spectrum. Suppose the beam is perpendicular to the face of the grating. A spectrum can be seen at a short distance on both sides of the beam; this is termed a *spectrum of the first order*. At a greater angle on both sides more spread out or dispersed spectra spectra of the second order) are visible; then follow third order spectra and so on, until the observer is behind the reflecting face of the grating.

The Spectroscope.—After a pure spectrum has been produced, either by means of a prism or diffraction grating, it can be observed by the naked eye, or through a small telescope, in which case the spectrum is magnified. A spectroscope is an instrument for producing and observing spectra. It consists essentially of (1) a *collimator*—that is, a tube having a slit at one end in the principal focus of a lens at the other. The slit can be widened or narrowed by means of a screw, thus regulating the width of the slab of light; (2) a prism or diffraction grating to disperse the light; (3) a small telescope to observe the resulting spectrum. In the eye-piece of the telescope, cross wires, or a pointer of some kind, is fixed for use as a reference point in the field of view.

The Adjustment of a Spectroscope.—To adjust a spectroscope we proceed as follows:—(1) The eye-piece is moved in and out until the pointer is in focus. (2) The eye-piece is gently replaced and the view-telescope is focussed on a distant object by a rack and pinion attached to it. (3) A spirit-lamp, or Bunsen burner, having a little salt or soda in it, is placed a few inches from the slit, and observed through the telescope and collimating lens, with the prism or diffraction grating removed. A sharp image of the slit is obtained by altering the length of the collimator. (4) The slit, and therefore the image, should be narrowed until it is very fine and distinct. (5) The prism is put in position. It bends the beam from the slit towards its base. The view telescope is moved until the refracted image is seen. The prism is then rotated until the image is least refracted. This is the position of minimum deviation. Briefly, the operations are as follows:—Focus pointer, focus telescope, focus collimator, regulate width of slit, fix prism at minimum deviation, and observe the spectrum.

Different Kinds of Spectra.—If the light of an incandescent body, such as the ball of lime of an oxy-hydrogen light, or the white part of a gas-flame, is viewed by means of a spectroscope, a continuous band of colour, extending by beautiful gradations from the red to the violet, is seen. This is a *continuous spectrum*. If a flame in which common salt or soda (both of which contain sodium) is burning is similarly observed, a bright yellow line, really consisting of two lines close together, is seen, instead of the continuous spectrum. Add a little of some salt of thallium to the flame, and a green-coloured line becomes visible. Strontium shows a number of red lines and a clear green one; barium a number of bands extending from the green to the red. Different substances, then, when burnt in a flame, present different appearances in the spectroscope. Different kinds of flames also give different spectra; thus the flame of burning hydrogen has a characteristic spectrum, and so have other gases. The best way to make a gas luminous is to put it in a closed tube, near the ends of which two bits of platinum wire are inserted. When an induction coil is connected with the projecting ends of wire and put in action, a current of electricity passes from one wire to the other inside the tube, and makes the imprisoned gas luminous. The spectra given by different gases can thus be compared.

Besides the continuous and discontinuous spectra, there is a third kind which can be observed in the following manner:—A spectroscope is directed to a lime-light, the result being that a continuous spectrum is seen. The flame of a spirit lamp in which common salt is burning is now placed so that the light from the incandescent lime must pass through it to reach the slit of the spectroscope. On observing the result, the close double line peculiar to sodium will be seen dark instead of bright. Shut out the lime-light by means of a screen, and they appear bright. If strontium, or barium, or any other substance is put upon the wick of the spirit-lamp, dark gaps are seen in the positions of the bright lines of each. Each vapour blocks out of the continuous spectrum the colours it emits when burnt. From such experiments as those described, three laws or axioms of spectrum analysis have been formulated.

Spectroscopic Axioms.—The three laws of spectrum analysis can be stated as follows:—

1. Incandescent solid or liquid substances, and gases under pressure, give a continuous spectrum.

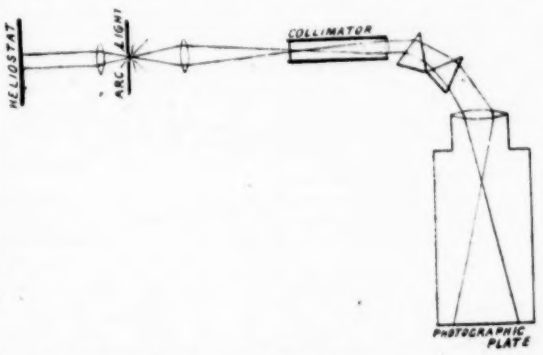
2. Vapours and gases under low pressure give spectra consisting of a number of bright lines or bands, which differ for different substances.

3. Vapours and gases are opaque to those particular rays of light of which their own spectra consist.

The Solar Spectrum.—When a spectroscope is directed towards the sun, a spectrum having a large number of dark lines (known as Fraunhofer lines), crossing it at right angles to its length, are seen. Many of these lines are found to be coincident in position with lines given by terrestrial substances, such as iron, calcium, etc. It is therefore inferred from axiom 3 that the sun's nucleus is densely gaseous, and therefore possesses a continuous spectrum, and that the elements existing in the sun's atmosphere, in the state of vapour, block out from this continuous spectrum the lines of which their own spectra consist. By matching the dark lines with bright ones given by terrestrial substances, the elements existing in the sun's atmosphere have been determined.

Comparison Spectra.—A small right-angled prism, known as a comparison prism, is often fitted to a spectroscope so that one of the faces will lie on the slit and cover up about half its length. If a flame is placed at right angles to the direction of the collimator, its light passes through the other face of the small prism to the hypothenuse, and is reflected into the slit. By this means it is possible to point the spectroscope towards the sun and observe the solar spectrum through the uncovered half of the slit, while the spectrum of a flame placed by the side of the collimator is being seen through the other half. The two spectra thus appear in juxtaposition, and the coincidence or non-coincidence of Fraunhofer lines with lines of known elements can be found. Another method of making the comparison is to observe the dark line which it is required to identify, and place the pointer of the view-telescope upon it. Substances are then burnt until one is found to give a line in exactly the same position as that in which the pointer is fixed. No comparison prism is needed in this method.

Photographic Comparisons of the Sun and Elements.—The best method of identifying elements in the sun was instituted by Prof. Lockyer. A mirror (known as a heliostat) is arranged so as to reflect a beam of sunlight in a constant direction. The beam is



brought to a focus by a lens. In the focus an electric arc-lamp is placed. A second lens concentrates the sun's image and the electric light upon the slit of the spectroscope. Half the slit is covered with a slip of paper; the electric light with a known substance burning in it is turned on, and the *arc-spectrum* of the substance is seen in the spectroscope. But Prof. Lockyer, and others following him, obtain photographic instead of visual observations. A sensitive plate is put in the place of the eye-piece of the view-telescope. The ultra-violet rays produce the greatest chemical effect, so the telescope, with dark slide containing the plate, is moved towards the ultra-violet part of the spectrum. When adjustment has been completed, the plate is exposed for a short time to the spectrum of the substance burning in the arc. During this exposure no sunlight illuminates the slit; after the arc has been going for a sufficiently long time, it is stopped The half of the slit through which the light has been passing is then covered, and the other half uncovered. Sunlight falls upon the slit and passes through the half previously covered. It traverses the prism or prisms, and its spectrum is caught by the sensitive plate. If the light of the electric arc pass through the bottom half of the slit and sunlight through the top half, a spectrum of the substances in the arc will appear upon the photographic plate below the solar spectrum. The two spectra are thus photographed under precisely the same conditions, and any bright lines of the

arc spectrum, which represent substances existing in the sun, will be coincident with dark lines in the solar spectrum. Instead of uncovering the two halves of a slit to obtain the two spectra in juxtaposition, the whole slit is frequently illuminated in turn by the lights of which a comparison is required, and the photographic plate is moved up or down before the second exposure, so that the spectra shall not be photographed upon one another, but in juxtaposition—that is, one lying above the other.

Elements in the Sun.—Professor Rowland, of Baltimore, has made an extended comparison of the spectra of terrestrial elements and the solar spectrum. He has identified thirty-six elements in the sun. The first six elements having the most conspicuous lines in the solar spectrum, and the first six having the greatest number of lines, are as follows. The six most abundant terrestrial elements are tabulated for comparison :—

Most Abundant Terrestrial Elements.	*Fraunhofer Lines, according to Intensity.*	*Fraunhofer Lines, according to Number.*
Oxygen.	Calcium.	Iron (2,000 or more).
Silicon.	Iron.	Nickel.
Aluminium.	Hydrogen.	Titanium.
Iron.	Sodium.	Manganese.
Calcium.	Nickel.	Chromium.
Sodium.	Magnesium.	Cobalt.

From the whole investigation, Professor Rowland remarks: 'Were the whole earth heated to the temperature of the sun, its spectrum would probably resemble that of the sun very closely.'

The Tele-Spectroscope.—The object-glass of a telescope concentrates the light of a celestial body to the principal focus. By a clockwork arrangement, the telescope is made to move at the same rate as the apparent motion of the sky. The celestial body under observation is thus kept in view as long as it is above the horizon. If a spectroscope is arranged so that its slit receives the image of the body in the principal focus, an observer will continually see a spectrum. In the case of the sun, or a planet, or any object having an image of an appreciable size, the spectrum has width. But a star appears as a luminous point on the slit. Its spectrum is therefore a coloured line. To give the line width, a cylindrical lens—that is, a lens having cylindrical instead of spherical surfaces—is placed somewhere in the path of the star-rays. Such a lens has the property of stretching a point into a line, or a line into a band. Usually it is put either in front of the slit, or between the eye and the eye-piece. The coloured line seen without the lens then appears as a coloured ribbon, having dark lines crossing it. A telescope fitted with a spectroscope, with or without a cylindrical lens, is termed a tele-spectroscope.

Methods of Photographing Star Spectra.—By putting in a sensitive plate in the place of the eye-piece of a tele-spectroscope, the spectrum of any celestial object can be photographed. In photographing star spectra by this method, a cylindrical lens is not usually employed. The spectroscope is arranged so that if the telescope did not move, the image of the star under observation would, on account of the apparent motion of the sky, travel from one end of the slit to the other. A star would only take a few minutes to travel along the slit in this manner. With a fixed telescope, therefore, a photographic plate at the eye end of the spectroscope would have a spectrum drawn upon it in a few minutes, the width of which is obtained by the star's movement along the slit. But a few minutes' exposure to the light of most stars is not sufficient to produce a good impression upon the plate. The telescope is therefore not fixed in one position, but driven at a rate nearly but not quite equal to the rate of movement of the sky. The star whose spectrum is required thus travels a very short distance along the slit during the exposure, staying at every point long enough for its light to act upon the sensitive plate. After the exposure has been completed the part of the slit along which the star has moved can be covered up by a slip of paper, and terrestrial elements can be burned in front of the slit for comparison spectra. Another method of photographic star-spectra is by means of the *object-glass prism*. The object-glass of a telescope has a large prism, or several large prisms, placed over it. The light from a star enters the prism, is decomposed, and falls upon the object-glass as a spectrum. The object-glass forms an image of the spectrum at its principal focus. Since a star is a luminous point, the spectrum thus produced is a coloured line, and as such can be seen or photographed. The collimator, slit, and view-telescope of an ordinary spectroscope are not required. The whole arrangement consists of (1) a prism or prisms over the object-glass. (2) The object-glass at the upper end of the telescope tube. (3) A photographic plate in a dark slide at the lower end. The prism is fitted over the object-glass with its edges pointing east and west. If the telescope were driven with absolute accuracy, the spectrum of a star would always be a line, but by regulating the driving clock so that the telescope moves a little too fast or slow, the line is gradually transformed into a band. For faint stars, the telescope must move almost at the proper rate, so that the widening out is very little, and the light of the spectrum acts for a long time on the same part of the photographic plate. Bright stars only need a short exposure, and the rate of loss or gain of the telescope must be much greater than for faint stars. Five minutes suffices to obtain a good spectrum of a bright star, whereas some stars leave very little impression upon the plate after their spectra have been acting upon it for two or three hours.

Spectra of Celestial Bodies.—The sun has a spectrum crossed by numerous dark lines; the moon and planets exhibit practically the same spectrum, showing that they are chiefly seen by reflected light. Comets have a spectrum of bright bands, and sometimes lines, showing that they shine by their own light. The patches of celestial mist known as *nebulæ* exhibit spectra of bright lines and bands (radiation spectra), some of which are seen in comets. 'Bright line' stars have spectra almost indistinguishable from that of a nebula. Most stars show dark lines in their spectrum (absorption spectra), produced by absorption in their atmospheres in a similar manner to the Fraunhofer lines of the solar spectrum.

Classification of Stellar Spectra.—Stars have been classified according to their spectra. The three chief classifications have been drawn up by Secchi, Vogel, and Lockyer. Secchi's classification is as follows :—

Type I.—Broad and dark lines due to hydrogen are a marked feature. Other lines faint or invisible.

Type II.—Numerous fine lines; like the solar spectrum.

Type III.—Dark bands or flutings fading away on their *less* refrangible sides.

Type IV.—Dark bands or flutings fading away on their *more* refrangible sides.

Vogel's classification is as follows :—

Class I.—Hydrogen lines conspicuous; metallic lines faint or invisible.

Class II.—Metallic lines conspicuous; hydrogen lines losing their supremacy.

Class III.—Dark bands, as well as lines due to metals.

Vogel's classes are divided into sub-classes to include various peculiarities of spectra. They are based on a descending scale of temperature, all stars being supposed to have cooled down from the condition of Class I.

Meteoritic Classification of Stellar Spectra.—In 1887, Professor Lockyer proposed a new grouping of celestial bodies, in which stars increasing in temperature were to be distinguished from those decreasing in temperature. He recognises seven groups, each of which is divided into species and sub-species. The last species of one group merges into the first species of the next above it; hence there is no hard and fast line of demarcation between any two groups. The criterion of each group is as follows :—

Group I.—Radiation of lines and flutings. Includes nebulæ, bright-line 'stars' and comets at aphelion. Absorption of lines and flutings appears in the last species.

Group II.—Mixed radiation and absorption of flutings.

Group III.—Line absorption predominant. Evidence of *increasing* temperature.

Group IV.—Absorption of hydrogen predominant. Highest temperature. About one-half the stars belong to this group.

Group V.—Line absorption, with *decreasing* temperature.

Group VI.—Absorption of carbon flutings predominant.

Group VII.—Dark bodies having no spectra of their own.

This grouping embraces all kinds of celestial bodies, and so differs from all others.

Doppler's Principle.—The pitch of the note emitted by a sounding body only remains constant so long as the listener and the body are in relative rest. Motion of approach increases the pitch, recession lowers it. This principle applies to light. When a body is moving towards the earth, the lines in its spectrum are shifted towards the violet end; when moving away from the earth, the shift is towards the red end of the spectrum. The shift is found by measuring the difference in position between the lines in a star-spectrum and the positions of the lines given by their terrestrial equivalents. If there is no *motion in the line of sight* the two sets of lines coincide.

Motion in Line of Sight.—By the application of Doppler's principle the approach or recession of stars and other celestial bodies are found. Let v = velocity of the source in the line of sight; V the velocity of light (186,000 miles per second); λ true wave-length of line; λ' observed wave-length. Then

$$\lambda' = \lambda \left(\frac{V}{V + v}\right) \text{ in the case of approach.}$$

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$$\lambda' = \lambda \left(\frac{V}{V - v}\right) \text{ in the case of recession.}$$

For example, true wave-length of F line of hydrogen = 4860. If the observed wave-length is 4859, we have

$$v = \frac{V(\lambda - \lambda')}{\lambda'}$$

$$= \frac{186000\ (4860 - 4859)}{4859}$$

$$= \frac{186000}{4859} = \frac{38 \text{ miles per second}}{\text{towards the earth.}}$$

Star-groups and Names.—The stars appear as if fixed to a solid revolving dome. Some of the bright stars form well-marked groups. The ancients divided the sky into regions, and termed them constellations. Constellations are analagous to countries on the earth, individual stars to towns. The ancients named the constellations after mythological characters. Examples: Orion, Hercules, Andromeda, and Perseus. Many bright stars have proper names (chiefly of Arabic derivation), *e.g.*, Antares, Achernar, Altair, Vega, and Sirius. Bayer (1603) used Greek letters. Brightest star in a constellation is generally named Alpha (α), next brightest Beta (β), and so on. After the Greek letter comes the name of constellation in genitive cases, *e.g.*, α Lyrae = brightest star in constellation Lyra; α Bootis = brightest star in Bootes. Roman letters and numbers also employed, *e.g.*, x Tauri, and 61 Cygni. Star catalogues contain positions (right ascensions and declinations) of stars. In referring to a star in a catalogue, the name of the catalogue follows the number of the star, *e.g.*, 1830 Groombridge = the star number 1830 in Groombridge's catalogue; 152 Schjellerup, or 152 Schj., = the star number 152 in Schjellerup's catalogue.

Magnitudes of Stars.—Stars differ in brightness. Classification into *orders* of brightness or *magnitudes*. Very bright stars are of the first magnitude; those just visible are of the sixth magnitude. An average 1st mag. star is 100 times brighter than an average star of the 6th mag. The light-ratio between stars of successive magnitudes is the fifth root of 100, that is, 2·51. Hence if

A star of the 1st magnitude = 1.
" " 2nd " = 1 × 2·51 fainter.
" " 3rd " = 1 × 2·51 × 2·51 fainter.

The step from one magnitude to the next is thus 2·51.

Causes which affect the brightness of stars:—(1) Distance from the earth, (2) extent of luminous surface, (3) quality of light emitted.

Double and Multiple Stars.—Many stars which appear single to the naked eye, are found to consist of two or more when observed telescopically. Double stars were formerly supposed to be two stars lying in the same direction, and therefore only 'optically double.' Measures show that the distance between many double stars, and the direction of the line connecting the two, vary from year to year. Inference that the two bodies are revolving round one another. Periods from 14 to 1,500 years. Stars thus physically connected are known as 'physical doubles,' or *binary stars*. Some binaries have been followed through a complete revolution.

Stellar Parallax.—The angle subtended at a star by the radius of the earth's orbit is the parallax of that star. In consequence of the earth's orbital motion, all stars describe minute ellipses (parallactic ellipses) upon the celestial sphere in a year. The angular dimensions of the semi-major axis of a parallactic ellipse is a star's parallax. Methods of determining parallax: (1) Absolute method. A star's position (right ascension and declination) is accurately measured during a whole year. When the measures are plotted, they are found to arrange themselves more or less in a minute ellipse. (2) Differential method: Faint stars near the one whose parallax is desired are assumed to be so far away that they have no parallax and can be considered as points on the celestial sphere. The relative positions of the one under determination and the fainter ones are measured throughout the year. The differences give the dimensions of the parallactic ellipse. (3) Photographic method: Instead of measuring the relative distances of selected stars in the telescope, small photographs are taken from time to time and measured under the microscope. The parallactic ellipse is found as in (2).

Distances of Stars.—Distances of about thirty stars known with fair degree of accuracy. Impossible to grasp the immense distances of stars if expressed in miles. Utilisation of the velocity of light (186,000 miles per second). The distance light travels in a year (about six billions of miles), taken as the unit of stellar distance, and termed the *light-year*. Distance of α Centauri, the nearest star, 4 light-years, 61 Cygni, and Sirius, 8 light-years.

Proper Motion of Stars.—When observed over a long period of time, stars are found to have changed their position on the celestial sphere (proper motion). Stars cannot therefore be properly called 'fixed.' Greatest amount of proper motion, seven seconds of arc (7″) in a year (1830, Groombridge). Proper motion of 61 Cygni, 5″ a year, α Centauri, 4″ a year. Determination of the actual velocity *across the sky* made possible for stars of known distances. Velocity of 1830 Groombridge, 200 miles per second; of α Centauri, 436,000,000 miles per year.

Variable Stars.—Some stars vary in brilliancy and are known as *variables*. They are classified into, (1) Stars which are of equal brilliancy for several days, and then suddenly lose a large proportion of the light for a few hours. Example:—Algol or β Persei. (2) Stars which are comparatively faint for several months, but periodically increase considerably in lustre. Example:—o Ceti or Mira Ceti. (3) Stars which regularly and gradually increase and decrease in brightness in the course of several days. Example:—β Lyrae.

Explanation of Variability.—Every star of the Algol type most probably has a dark companion revolving round it. When this body passes in front of the bright star, the latter is partially eclipsed. Stars of the Mira Ceti type have been supposed to possess bright and dark sides, which are alternately turned towards the earth. Professor Lockyer suggests that the star we see is really a swarm of meteorites, around which another swarm is revolving. When the two swarms pass one another, a number of collisions of individual meteorites occur, and produce a great amount of light and heat. The β Lyrae type of variables probably owe their variability to two or more stars revolving round one another. Professor Lockyer has remarked: 'All *regular variability* in the light of cosmical bodies is caused by the revolution of one swarm or body round another (or their common centre of gravity). . . . All *irregular variability* in the light of cosmical bodies is caused (*a*) by the revolution of more than one swarm or body round another (or their common centre of gravity), or (*b*) by the interpenetration of meteoritic sheets or streams.

The appearance of 'new stars' is accounted for by (*b*).

Questions set at the May Examinations.

1. State the various methods now employed in obtaining the spectra of the sun, stars, and nebulæ. (1892.)
2. Give a method employed in the determination of the stellar parallax. (1892.)
3. How have stars been classified in relation to their spectra? (Honours, 1890.)
4. What is meant by the proper motions of the stars, and how has the distance of certain stars been ascertained? (1889.)
5. State what you know about variable stars. (1888.)
6. How do you account for the dark lines in the solar spectrum? (1885.)
7. Compare the chemical constitution of the crust of the earth and that of the atmosphere of the sun. (1884.)
8. In what way does the spectroscope enable us to determine the composition of the heavenly bodies? (1883.)
9. State what you know concerning the chemical and physical constitution of stars (excluding the sun). (1882.)
10. Explain the terms 'dispersion' and 'minimum deviation' as applied to a ray of light. (1880.)

Questions set at the December Examinations.

1. State the chief chemical elements in the earth's crust and atmosphere, and the chief elements in the atmosphere of the sun. (1887.)
2. How are the distances of stars determined? (1887.)
3. State what you know about the composition of white light, and show (1) How this may be studied by simple experiments, and (2) its bearing upon the composition of stars. (1879.)
4. Describe the construction and mode of use of the spectroscope. State what you know about the spectrum of sodium, of chlorine, and of the sun. (1878.)

Physical Geography Questions.

1. Calculate the change in the weight of the atmosphere on a square yard of surface when the mercury in the barometer falls one inch (1891). Answer 648 lb.
2. What do you learn from the statement that on one day the barometer indicated 29 inches, and on another day 28 inches? State what you know of the causes that produce this difference. (1890.)
3. Explain the ordinary method used in determining the 'mean annual rainfall' of a place, and state the chief sources of error in the observations which have to be made. (1889.)
4. I wish to compare the barometric readings taken at two places; what data with respect to these places will it be necessary for me to have, and why? (1888.)
5. Describe the mode of formation of hoar-frost, and the conditions under which it takes place. (1887.)
6. What is meant by 'the pressure of the atmosphere,' and how is the amount of that pressure determined and expressed? Within what limits is the pressure of the atmosphere liable to

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variation, and what are the causes of this variation in pressure? (1886.)

7. Explain what is meant by 'evaporation' and 'ebullition,' and describe the effects which evaporation and condensation produce on the temperature of the atmosphere. (1885.)

8. What are the chief corrections which have to be applied to the readings of a barometer? Explain why these corrections are necessary. (1885.)

9. Explain the principle and mode of construction of the mercurial barometer. (1884.)

10. How would you explain the low temperature which prevails in the higher regions of the atmosphere? (1882.)

11. What are hygrometers? Explain the construction and mode of use of some form of hygrometer. (1881.)

Questions on the Subjects of the Notes.

1. State what you know about the method of determining the velocities of stars in the line of sight.
2. How have celestial bodies been classified according to their spectra?
3. How do you account for the variability in the light of some stars?
4. Describe a method of determining the velocity with which light travels on the earth.
5. What is a diffraction grating, and what is its use?
6. State the principles upon which spectrum analysis depends.
7. How are photographic comparison spectra of the sun and elements obtained?
8. State exactly what is meant by the 'magnitude' of a star.
9. How have celestial bodies been classified according to their temperature?

VITAL STATISTICS.

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Late Scholar of Balliol College, and Radcliffe Travelling Fellow; Deputy Lecturer on Physiology at St. George's Hospital, London, W.

1. The most important statistics necessary for health purposes are—
(*a*) The death-rate or annual mortality.
(*b*) The birth-rate.
(*c*) Mean age at death
(*d*) Mean duration of life.
(*e*) Probable duration of life.
(*f*) Expectation of life as shown in life tables.

2. *The death-rate* is usually expressed as so many deaths per thousand population per annum. Thus, in order to find the death-rate, multiply the number of deaths by 1,000 and divide by the population. If, in a population of 100,000, 2,000 die in one year, the death-rate for that year is—

$$\frac{2{,}000 \times 1{,}000}{10{,}0000} = 20.$$

In one question, No. 4 in the list appended to these notes, the population of one district was 20,000, and the death-rate per annum 30 per 1,000; of another, 30,000, with a death-rate of 20 per 1,000 per annum; the death-rate of the combined districts is found by calculating the total number of deaths, multiplying by 1,000, and dividing by the united population. Thus, in the first district with 20,000, and a death-rate of 30 per 1,000, the number of deaths are 600; in the second, with 30,000, and death-rate of 20, the number of deaths are 600 also: total number of deaths = 1,200, and the combined population is 50,000.

∴ death-rate of the combined districts is $\frac{1{,}200 \times 1{,}000}{50{,}000}$

which is 24.

3. One important sub-division of the general death-rate is that due to the zymotic diseases, so called by the late Registrar-General, Dr. Farr. In 1884, the general death-rate for England was 19·6 per thousand; of these, the zymotic death-rate amounted to 2·6, or about one death out of every seven was due to a zymotic disease. Under this head are included measles, scarlet fever, diphtheria, smallpox, whooping cough, diarrhœa, typhus and typhoid fever.

4. *The Birth-rate* is calculated similarly. The number of births is multiplied by 1,000, and the product divided by the population. It varies from 30 to 40 in different districts of England. The birth of every child must be notified to the Registrar of Births and Deaths within forty-two days.

5. *Mean age at death.*—To find this, the ages at death are added together, and the sum divided by the number of deaths. It is about 29 years.

6. *Mean duration of life* differs from the above unless the population is stationary, and this is rarely the case. It is about 41 years. It may be calculated from the formula $\frac{2}{3a} + \frac{1}{3b}$ where a is the death-rate per unit of population, and b is the birth-rate per unit. If birth-rate is 35, and death-rate 20 per 1,000, then $\frac{2}{3 \times \cdot02} + \frac{1}{3 \times \cdot035} = \cdot04$ per unit, or 40 per 1,000 (Blyth). It is no crucial test of the sanitation of a district.

7. *The probable duration of life* is the age at which a given number of children, say 1,000, born at the same time become reduced in number to one-half.

8. *Life-tables* showing the *expectation of life* at all ages were constructed by the late Dr. Farr, Registrar-General. Such tables are the best test of the health of a country. In Dr. Farr's tables they were calculated on the deaths of a supposed population of 1,000,000, and the number dying each year, until the whole became extinct. They were constructed on the death-rates between 1838 and 1854; but new tables have been constructed since 1886 by Dr. Ogle, Dr. Farr's successor, on the basis of the death-rates from 1871-1880. In round numbers,

At the end of the	1st year	850,000	are left.
,,	5th ,,	750,000	,,
,,	20th ,,	700,000	,,
,,	30th ,,	650,000	,,
,,	40th ,,	575,000	,,
,,	50th ,,	480,000	,,
,,	60th ,,	350,000	,,
,,	70th ,,	200,000	,,
,,	80th ,,	90,000	,,
,,	90th ,,	10,000	,,
,,	100th ,,	150	,,

Side by side Dr. Ogle gives the average number of years a person may be expected to live, thus:—

Age	Expectation of Life.
at Birth	43
at 5	50
20	40
30	33
40	26
50	19
60	13
70	8

On a comparison of the life tables of Dr. Farr and Dr. Ogle, we notice an advance up to the age of 67 in males, and up to the age of 90 in females. Beyond these ages there is no improvement at all, but the reverse. The lessened death-rate is indeed best seen in earlier life, so that a greater number of children reach middle age than in former decades, and a larger number of people are left to die later. Thus a death-rate in which there is included a larger percentage of death in old age is favourable, as showing the strides made by sanitary science and other factors tending to longevity.

As a matter of fact such tables should be calculated from statistics derived from the million throughout its existence, but at the end the sanitary conditions would be enormously changed.

Wittich's method of calculating the expectancy of life at any age is simple, but only approximate. He gives the formula $x = \frac{3}{4}(80 - a)$, where a is the present age; thus at 30, $x = \frac{3}{4}(80 - 30) = 33{\cdot}3$. De Moivre estimated that of every eighty-six persons born one died every year until all became extinct. This would give the probable duration of life forty-three.

We regret that owing to the great pressure on our space this month we are compelled to hold over a portion of this contribution (Vital Statistics) until our next issue.

PUBLICATION REVIEWED.

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SUPPLEMENT to the February 1893 Number of the 'PRACTICAL TEACHER.'

How to Produce 'The Jester.'

BY THE AUTHOR.

BY the kindness of the Editor, I am permitted to jot down here a few hints, born of experience, which may be of use to those who propose to produce the Prize Cantata. Teachers who do me the honour of perusing the libretto of 'The Jester,' will probably notice that there is considerably more sequence in the plot and more dramatic opportunity afforded, than in the usual run of school cantatas. This is designedly so, for I consider that, as adults are to be the auditors, the play, while suited to the understanding and capacity of children, should be such as to interest those of a 'larger growth.' I have chosen a mediæval subject as lending itself better to romantic treatment and as affording opportunity for dressing and grouping.

The Cantata may be performed with or without scenery. If scenery be used, a body of children seated in front of the stage, well under the eye of the conductor, can bear the brunt of the chorus-singing. Teachers in a large town will have no difficulty in procuring 'cloths' of a woodland scene, and of a castle background. Those in the country can paint the scenes for themselves, getting a multitude of hints from a book published by Lacy, of the Strand, on 'Amateur Scene-painting,' or can hire them from the costumier, Carr, of Norton-street, Liverpool, for a moderate sum. If scenery be out of the question, you must revert to the Elizabethan practice and mention the venue in the programme. A gallery at the back of the stage can then accommodate the useful, but unornamental chorus.

Dresses can be hired from a professional costumier, or may be constructed by lady friends. In the latter case, a few hints, though only from 'a mere male' may be of assistance. *The Countess* would be suitably dressed in a ruby-coloured princess robe, with hanging sleeves, lined with cream, and girded by a belt from which a chatelaine or pouch depends. *Kate* might wear a short, grey skirt, with a white muslin apron and a white muslin bodice, over which is a grey corselet. High, grey, laced boots would complete an effective costume. The peasant girls, attired in a similar dress, but with all varieties of colour in skirts and bodices, would assist in forming picturesque groups. The *Outlaws* should wear Lincoln green tunics, broad brimmed hats, with a feather, and complete their costume with top boots, hired, of course, from a costumier. Locksley will wear this costume, varied in details. The *Retainers*, in the second act, would satisfy partial critics if attired in dark coloured tunics, top boots, and steel helmets. The Outlaws should be armed with bows and swords, and the Retainers with spears. The Earl's first dress will afford little difficulty; a well arranged cloak, a slouch hat and top boots will be quite satisfactory. His second dress will be the same as the Jester's. The Fool's attire will be best suggested by prints, which almost any Christmas number of the Illustrated Magazines will afford. *Sir Harry Mountjoy* may be dressed in mail (hired, of course), or in long hose, trunks, doublet and cap. My usual custom is to hire the dresses of the male characters, and to persuade the girls to provide their own dresses. These suggestions, I am aware, are far from exhaustive, but the taste and skill of enthusiastic lady friends may be safely relied upon to produce an effective '*tout ensemble*.'

In selecting children for the characters, you will bear in mind that Bennet, the Jester, the Countess, and Kate must be solo singers, and the other important personages good reciters. A junior pupil teacher might, if necessary, play the part of the Earl. Teach your principals to speak out boldly and deliberately and instruct your solo singers to come to the front of the platform. In rehearsing mark out an oblong on the floor of the schoolroom to represent the stage, and treat it as such. There will then be no awkwardness when the performers tread the 'mimic boards' in reality. You will probably find that a dozen Outlaws, a dozen Peasant Girls, and eight Warders will be all your stage can accommodate. If the children can be made to realise the characters they are to play, they will enter into the spirit of the thing in a surprising manner, and will often suggest action and gesture for themselves, that is a sure idea of the possession of real imagination. Let the children suit 'the action to the word and the word to the action,' but do not let their gestures be excessive in number, or obviously the result of teaching. A few actions, well timed, are far more effective than a constant shrugging of the shoulders and an everlasting 'wafture of the hand.' You will find that at various important crises of the play you can compose stage pictures. Arrange these with care, and the result will compensate for all the extra trouble involved. Let the chorus be prompt to enter and prompt to exit, and try to make the children 'flesh and blood' individuals and not mere lay figures. The country dance, if executed with spirit, may be relied upon 'to bring down the house.'

If Dr. Dunstan will allow me to trench on his province, I would suggest that the voices be accompanied by a violin, in addition to the piano. My orchestra usually consists of piano, two violins, and a cornet. With this support, that abomination, flat singing, is avoided.

I trust these few hasty remarks will be of assistance. The production of such a Cantata demands much care and thought, but my experience is that the result, equally pleasing to auditors and performers alike, fully repays all the trouble involved, redounding, if well carried out, to the credit of the school, and shining as a red letter day in the calendar of the children.

If any reader of this paper should contemplate performing the Cantata, and any difficulty should present itself, I shall be glad to assist him to the best of my humble powers. A letter, under cover, to the courteous Editor of this paper will be forwarded.

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The Earl of Oakleigh.	
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Will Witless	A Jester.
Bennet	A faithful retainer.
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The Countess of Oakleigh.	
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ACT I.

Woods near Oakleigh Castle.

(*Enter Bennet L.*)

Bennet:
Why, where can Locksley be, and all his band?
In sooth, they wander far from home to-day.
What ho! there, comrades.

(*Botham suddenly appearing R. with bent bow.*)

Botham:
Stranger, stand,
Or I let fly. (*Approaches Bennet.*)
Ha! ha! I knew thee not.
Welcome, old coz; I took thee for a foe,
And surely *I* should know thee as a friend,
For who but thou when wife and child lay sick——

Bennet:
Peace! It was naught. Where is thy chief to-day?

Botham:
Marry, ill sped. He's gone to yield himself.

Bennet:
To yield? What meanest thou? Resolve me straight.

Botham:
He's got himself a wife, and that's a thrall
Binds closer than the stoutest links of steel.

Bennet:
Ha! ha! thou rogue. Thou hast a pretty wit.

Botham:
Aye, in the chantry near St. Eustace' well,
Our Locksley weds his bonnie Kate to-day.

Bennet:
Well, all my blessings on the happy pair.
When come they home?
Botham:
Within this laggard hour.
And then we'll see gay doings on the green.
Bennet:
Would that the noble Earl (God rest his bones!)
Were ruling now in Oakleigh's castled walls.
Not in the mazes of this tangled wood,
The sky his roof, the green sward under foot,
An outlaw hunted forth from home and kin,
Had Locksley seen his nuptial morning dawn.

Botham:
Had *he* but lived, in yonder lofty hall,
Right mirthfully our revel would be kept.

Bennet:
But he is gone, and now a tyrant reigns,
Where once a kindly hand held gentle sway.
Alas! alas! the good old days are past,
And we may sigh in vain for their return.

*No. 1 Song.—THE GOOD OLD DAYS.

Andante Moderato.
mf
Bennet.
1. O for the good old
2. O for the good old
mf
dim.
days, now gone, When knights were tru - ly brave, When forth they sped in ar - mour bright, To
days, now gone, I sigh for them in vain, When ev - 'ry lord a spot - less shield, Would
cres.
f
p
p
f
dim.
suc - cour and to save. When war - riors fought for Love and Truth, And scorned to gild the
with his blood sus - tain, When ev - 'ry door was o - pen'd wide, And ev - 'ry stran - ger
f
dim.

* *Specially suitable for a 'Baritone' Voice.*

rall.
A tempo.
palm; Where are the sons of Ar - thur's Knights? Where is the an - cient charm?
free To take his fill and then de - part, And bless our char - i - ty.
colla voce.
A tempo.
8ve.
Chorus.
Gone are the days, gone are the bays, Our war - riors no - bly bore,
8va
rall.
con. forza.
Repeat Chorus ad lib.
Gone is the flower, gone is the power That graced our land of yore!
D. S.
colla voce.
dim.
cres.
At end of Second Verse a Horn is heard.
Moderato

Botham:

'Tis Locksley's horn. List to the merry shouts.

(*Enter outlaws, girls, Locksley, Kate, &c., R. Locksley and his bride take raised seats.*)

No. 2.—CHORUS. (*1st & 2nd Trebles.*)

Animato.
Voices.
mf cres.
Hail the Bridegroom, Hail the
Bride, Hap - pi - ness their path be - tide, Joy and mirth and ev - 'ry
glad - ness, Naught of sor - row, naught of sad - ness, Smile up - on them, joy - ous
sun, Speed the life, so well be - gun.
Hail the Bridegroom, Hail the Bride, Hap - py pair, the green - wood's pride!
2nd time ff. rall.
D.S.

* *Small notes, here and elsewhere, for Piano.*

Locksley:

Thanks, thanks, my merry men and maidens fair;
Your lips, I know, are tuned by loyal hearts.
No schoolman I, or in a courteous phrase,
I'd doubly grace the gratitude I feel.
Believe me, friends, when you are pleased to wed,
I'll give you 'joy' in such right jovial sort
As ye have wished me happiness to-day.

Kate:

Let mirth be lord of all. Come, dance and sing,
And with your laughter make the welkin ring.

No. 3 Country Dance.—SIR ROGER DE COVERLEY.

This dance should be played through about three times, while the children dance or march round the stage. Near the end of the last time 'Enter two Outlaws roughly dragging Will Witless,' when the music should suddenly cease.

(*Enter Outlaws roughly dragging Witless R.*)

Witless:

Good Sirs, be gentle. Pull me not to pieces, for though I play many parts, yet cannot I play any parts *in many parts.* Be gentle, Sirs.

Outlaw:

Thou art a jester, art thou?

Witless:

Truly, Sir, thou hast nosed it like a boar hound.

No. 4.—JESTER'S SONG.

Gaily.
1. I've quip and crank, I've
2. I've pa - ra - dox and
3. With bau - ble bright, and
mf
mp
joke and jest, From ev - 'ry land, from east and west, I've sayings quaint, and re - par - tee Will charm you with its
pun - ning saw, I've so - phis - try for wor - dy war, I've riddle and co - nun - drum deep, An an - o - dyne for
cockscombe gay, A joy - ous loon, I take my way, I laugh the tear from many an eye, And sing to grief a
p
p
cres.
mf

mp
slightly rall.
poig - nancy.
those who weep.
lul - la - by.
I've song and bal - lade, rhyme and catch, At ban - ter, too, I
I've many a jibe from mer - ry France, And I can show each
With Ho! Ho! Ha! and He! He! He! I'll make you hold your
mf
colla voce.
mf A tempo.
ad lib.
Chorus. p
have no match; I've can - zon - et and round - e - lay; Ask what you will, 'tis here to - day.
kind of dance, For Jol - ly Jove shone on my birth, And gave me, with a laugh, to Earth.
sides with glee, And in re - turn not much I ask, A sil - ver pen - ny for my task.
In fact you'll find, if
A tempo.
mp cres.
f
colla voce.
p
cres.
f
con forza.
Quick.
you're inclin'd, When I outpour my wondrous store, My re - pertoire out - weighs a score Of o - ther travelling Jes - ters!
f
mp
f
mf cres.
f

Witless:

I can rhyme you, riddle you, quibble you. Good Sirs, I have humours for all occasions. I am solemn, merry, serious, mirthful, light-hearted, philosophic, feather-brained, sad, jolly and jocular, all in a breath.

Locksley:

Then don thy merriest humour for the nonce,
For here we celebrate a wedding day.

Witless:

Art thou a married man?

Locksley:

Ay, so it please thee.

Witless:

Good Sir, thou art a married man, whether it please me or no. Come, if thou wouldst spend thy wedlock happily, give heed to my advice.

Locksley:

What is't?

Witless:

Beware of the bone of contention.

Locksley:

The bone of contention? What bone?

Witless:

Marry, Sir, the *jaw bone*, for that breeds more contention than aught else in this wicked world.

(*Enter Oakleigh incognito, slouch hat and cloak, R. He is set upon by two outlaws, whom he floors.*)

Oakleigh:

Unhand me, lads! Ye are no match for me.

Locksley (*coming forward*):

Thou speakest bravely and thou strikest well.
We'll take no toll from any man to-day.
I greet thy prowess, stalwart knight, and thus
I pay thy ransom. (*Tosses money to outlaws.*)
Thou art free to go;
Tho', for the credit of my lusty band,
I fain would try conclusions, ere we part.
Wilt play a bout at quarter-staff with me?

Oakleigh:

Ay, if no other means I may requite
Thy woodland courtesy, my Locksley bold.

Locksley:

Thou knowest me?

NOTE.—The remaining part of this Cantata will appear in our next issue.